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The shift from the industrial age to the information age will continue to impact battle command at the brigade level in 2010 and beyond. This study considers how training can be adapted to keep up with change. Changes brought on by the increasing use of computers in military hardware is analogous to the changes brought on by the shift from linear infantry tactics in World War I to the more mobile and flexible mechanized and armor tactics of World War II. A review of recent observations from the Combined Training Centers (CTC) shows similarity between problems observed in battle command then and now, as well recurring deficiencies in battle command at the brigade level. How the private sector is transitioning from industrial age thinking and organizational structures to information age solutions provides insights into how the Army can adapt training of brigade battle command into the next century. The study concludes that human factors and the "brainware" of individuals and teams who execute battle command are more important than hardware and software, but are often forgotten or under-resourced. New emphasis and new technology are needed to bolster brigades as critical thinking, mentally agile, learning organizations. Time and resources must be focused on the brigade to allow more emphasis on training and mental agility and higher order thinking skills of battle command. Development of an information age automated "knowledge warehouse" and networked multlifunctional simulations in the unit area could help units increase their experience base and expand the individual "mental maps" that commander and staffs use to navigate the complex problems of battle command. The focused use of history, simulation, professional discussion and mentorship, as well as the increased personal involvement of the commander in battle staff training are ways to reach the goal of upgraded "brainware" and mental agility.

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HOW CAN MANEUVER BRIGADES TRAIN AND EDUCATE EXCELLENCE IN THE EXECUTION OF TWENTY-FIRST CENTURY BATTLE COMMAND AT HOME STATION?

A thesis presented to the Faculty of the U.S. Army Command and General Staff College in partial fulfillment of the requirements for the degree

MASTER OF MILITARY ART AND SCIENCE

by

LAWRENCE A. LEVINE, MAJ, USA
B.A., George Washington University, Washington, D.C., 1983
M.A., Webster University, St. Louis, MO, 1998

Fort Leavenworth, Kansas
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The opinions and conclusions expressed herein are those of the author and do not necessarily represent the views of the U.S. Army Command and General Staff College or any other governmental agency. (References to this study should include the foregoing statement.)

ABSTRACT

HOW CAN MANEUVER BRIGADES TRAIN AND EDUCATE EXCELLENCE IN THE EXECUTION OF TWENTY-FIRST CENTURY BATTLE COMMAND AT HOME STATION?, by MAJ Lawrence A. Levine, USA, 239 pages.

The shift from the industrial age to the information age will continue to impact battle command at the brigade level in 2010 and beyond. This study considers how training can be adapted to keep up with change. Changes brought on by the increasing use of computers in military hardware is analogous to the changes brought on by the shift from linear infantry tactics in World War I to the more mobile and flexible mechanized and armor tactics of World War II. A review of recent observations from the Combined Training Centers (CTC) shows similarity between problems observed in battle command then and now, as well recurring deficiencies in battle command at the brigade level. How the private sector is transitioning from industrial age thinking and organizational structures to information age solutions provides insight into how the Army can adapt training of brigade battle command into the next century.

The study concludes that human factors and the "brainware" of individuals and teams who execute battle command are more important than hardware and software, but are often forgotten or under-resourced. New emphasis and new technology are needed to bolster brigades as critically thinking, mentally agile, learning organizations. Time and resources must be focused on the brigade to allow more emphasis on training the mental agility and higher order thinking skills of battle command. Development of an information age automated "knowledge warehouse" and networked multifunctional simulations in the unit area could help units increase their experience base and expand the individual "mental maps" that commanders and staffs use to navigate the complex problems of battle command. The focused use of history, simulation, professional discussion and mentorship, as well as the increased personal involvement of the commander in battle staff training are ways to reach the goal of upgraded "brainware" and mental agility.

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Most importantly I wish to thank my wife Nancy, and our children Jessica and Dylan who have supported me during numerous nights spent in front of my computer. Without their love and patience this work would not have been possible.

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LIST OF ABBREVIATIONS

AAN	Army After Next
AAR	After Action Review
AD	Armor Division
ADC	Assistant Division Commander
AIT	Advanced Individual Training
ASAS	All Source Analysis System
AT	Anti-Tank
AWE	Advanced Warfighting Experiment
BCBL	Battle Command Battle Laboratory
BCTP	Battle Command Training Program
BOS	Battlefield Operating System
CALL	Center for Army Lessons Learned
CAS3	Combined Arms and Services Staff School
CCIR	Commander's Critical Information Requirements
CEO	Chief Executive Officer
CGSC	Command and General Staff College
CIC	Command Information Center
CMTC	Combined Maneuver Training Center
CNN	Cable News Network

COA	Course of Action
COL	Colonel
CONUS	Continental United States
CPT	Captain
CPX	Command Post Exercise
CTC	Combined Training Centers
DA	Department of the Army
DMZ	Demilitarized Zone
FM	Field Manual
FSB	Forward Support Battalion
FY	Fiscal Year
GHQ	General Headquarters
GPS	Global Positioning System
GSM	Ground Station Module
IBM	International Business Machine Corporation
IDF	Israeli Defense Force
IPB	Intelligence Preparation of the Battlefield
JRTC	Joint Readiness Training Center
JSTARS	Joint Surveillance Target Acquisition System
MCS	Maneuver Control System
MSE	Multi-Subscriber Equipment

NATO	North Atlantic Treaty Organization
NCO	Non-Commissioned Officer
NIMA	National Imaging and Mapping Agency
NTC	National Training Center
O-C	Observer-Controller
OOTW	Operations Other Than War
OPEC	Organization of Petroleum Exporting Countries
OPFOR	Opposing Force
PAM	Pamphlet
PIR	Priority Intelligence Requirement
R&D	Research and Development
R&S	Reconnaissance and Surveillance
RTO	Radio-telephone Operator
SAMS	School of Advanced Military Studies
SIDPERS	Standard Installation/Division Personnel System
TDMP	Tactical Decision Making Process
THP	Take Home Packet
TOC	Tactical Operations Center
TRADOC	Training and Doctrine Command
TTP	Tactics, Techniques and Procedures
UAV	Unmanned Aerial Vehicle

UHF	Ultra High Frequency
USAF	United States Air Force
USR	Unit Status Report
VMI	Virginia Military Institute
VTC	Video Teleconference
ZOS	Zone of Separation

CHAPTER 1

INTRODUCTION

> It cannot be too often repeated that in modern war . . . the chief factor in achieving triumph is what has been done in the way of thorough preparation and training before the beginning of the war.[1]
>
> Theodore Roosevelt, Graduation Address, 1902

Purpose

The purpose of this study is to examine how maneuver brigade commanders and battle staffs can train and educate excellence in the execution of twenty-first century battle command at their home stations.

Intent

One-hundred years after the Spanish-American War the commander's guidance expressed by U.S. Army veteran and later Commander-in-Chief Theodore Roosevelt still rings true today. This paper seeks to holistically examine the distant "terrain" of twenty-first century battle command and determine ways that brigade commanders and staffs can prepare themselves individually, as leaders, and collectively in the cognitive skills of battle command. The goal is to help brigades to succeed in the evolving environment they can expect to face in the year 2010 and beyond.

Importance of this study

The Army's ability to fully leverage and exploit the benefits of technology--and to overcome its shortcomings--will continue to depend on a high quality force of soldiers able to think, create, innovate, and exercise mental agility in the fast-paced and high stress

environment of tactical operations. Whether in war or operations other than war the Army will continue to depend on maneuver combined with rapid and precise engagements by small (and possibly smaller) units to overcome the mass and home field advantage of a wide variety of potential adversaries in future force projection operations. Through battle command, commanders and their staffs employ the skills necessary to maintain tactical superiority through the leveraging of technology.

High-quality, well-trained units and leaders have been key to smaller forces achieving victory over larger ones since ancient times. History also teaches, however, that superior technology alone is no guarantor of victory. There are many examples of technologically superior forces being defeated by the technologically inferior but tactically superior force. The battle of Cannae in 216 B.C. is only one example of a smaller and technologically inferior force defeating their larger better equipped foe. But though the single leader--Hannibal--is often credited with achieving victory single handedly, no leader --not even a digital one--can be everywhere all at once on the battlefield. The victory at Cannae belongs also to Hannibal's brother-in-law, Hasdrubal, and the well-trained cavalrymen who executed the decisive breakthrough maneuver that led to victory.

Hannibal's defeat came at Zama in 204 B.C. at the hands of a seasoned warrior who learned agility not from his fellow Romans, but from first hand experience as a victim of Hannibal's tactics. Scipio Africanus trained and crafted the force necessary to achieve success where other Romans had failed. "Indeed, it may be said that Scipio Africanus succeeded by utilizing tactics he had learned from Hannibal."[2] Future training must strive

to learn these lessons before the battle, rather than after, as Scipio did. Digital technology holds the promise of allowing Army trainers to teach and learn on past and future battlefields against known and unknown adversaries without having to pay the cost in blood that Scipio did to earn his cognitive skills.

Other examples of technologically inferior forces defeating technologically superior forces can be seen at Little Big Horn in 1876, France in 1940, and Dien Bien Phu in 1954. The example of France, 1940 is further developed in chapter two.

In the fantasized world of science fiction, the story *Star Wars* pits an agile but resource-poor force against a technologically superior enemy. The rebels ultimately defeat their rivals by learning precisely when and where to strike. The imagined future of this tale could serve as both a lesson in the power of mental agility over technology and a warning of the need to anticipate and emphasize the Army's future training needs. Though *Star Wars* is only an imagined tale, as Albert Einstein once said, "Imagination is more important than knowledge."[3] Future commanders and staffs must be more imaginative than a host of potential foes.

Though battle command is ultimately the responsibility of the commander, accomplishing it is truly is a team effort between the commander and staff. It is not a one man show. It is and will be increasingly a collective task. A misnomer of history is the lesson that individual leaders alone bring about victory.

In the words of President John F. Kennedy, "Men can no longer know everything themselves; the twentieth century has no universal man. All men today must learn to

know through one another--to judge across their own ignorance--to comprehend at second hand. These arts are not easily learned. Those who would practice them must develop intensity of perception, variety of mental activity and the habit of open concern for the truth in all its forms."[4]

As with the opening quote from President Roosevelt, the challenge posed by President Kennedy, a U.S. Navy combat veteran, aptly applies to the future training challenges and opportunities this paper hypothesizes. Perhaps if the twentieth century has no universal man, the twenty-first century will require networked leaders? A challenge of this paper will be examining new ways to train the mental and imaginative networks needed for battle command in 2010 and beyond.

The study assumes the brigade remains an essential warfighting formation of the Army in the future. As a downsized force projection Army maneuver brigades from the National Guard as well as combat and combat support forces from the National Guard and the Army Reserve can be expected to increasingly work with active maneuver brigades as part of the Total Army. These forces are another factor to be considered in addressing the full scope of future training requirements. The importance of coalition forces and their interaction with maneuver brigades also gains importance in many contingencies, further expanding training requirements.

This study could result in improved training for active force maneuver brigade commanders and staffs. It may also help improve the training, comprehension, and

quality of battle command by commanders and staffs in National Guard, Army Reserve and possibly coalition forces as well.

By projecting future requirements and solutions for training battle command in 2010 and beyond this study supports long range planning and developmental efforts for new brigade level information and battle command systems. It may also support the development of the doctrine and tactics, techniques, and procedures (TTP) necessary to integrate the new systems into battle command and may help to visualize the future state of battle command. This research can help focus the application of lessons learned and information age technology to the training process and Force XXI and thereby help to maintain and improve the competitive edge of ground forces.

Assumptions

> In my own mind, we are at the beginning of a revolution in the way we will command soldiers and tactical units in battle.
>
> General (R) Fred Franks Jr.

This study assumes that General (R) Franks is correct. If the Army faces a revolution in battle command it is also likely that it will face a new and unfamiliar future in training battle command. Training and execution of battle command are only two of several areas where things will be done differently in the future than they are done today.

The dynamics of battle command are trainable. Though different minds will grasp the essence of these skills to varying degrees of competence, current and future leaders are capable of achieving higher levels of competence. The six dynamics of battle command, as

developed by the Battle Command Battle Lab (BCBL) are graphically illustrated in figure two.

Building on a foundation of knowledge and skills provided by the Army's institutional training base and the Combat Training Centers (CTCs) maneuver brigades are capable of training and providing additional education in this area at a higher degree of competence in critical areas than they currently are.

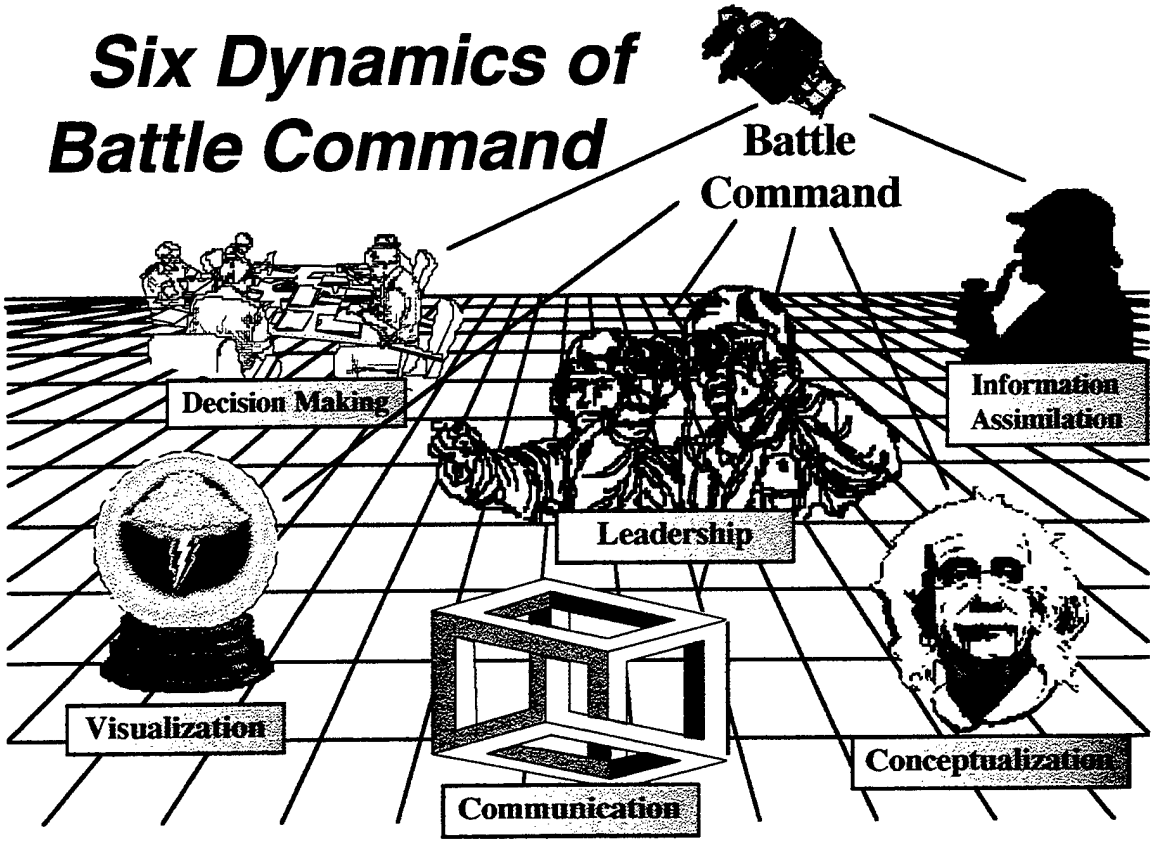

Figure 1. Six Dynamics of Battle Command

Higher-order skills and cognitive tasks of battle command are perishable skills. Units and individuals must practice them on a regular basis to ensure comprehension and assimilation. The dynamics of battle command are easier to talk about than they are to execute. In the words of Aristotle, "With regard to excellence, it is not enough to know, but we must try to have and use it."[5] New and future training should allow knowledge to be put to practice to build experience and ensure excellence.

The dynamics of battle command and the principles of war are assumed to remain essentially unchanged in the future. It is how they are applied that will change.

Training at brigade level will include the need to prepare for operations across the full spectrum of military operations. This includes: forward presence, force projection, operations other than war (OOTW), operations in depth, simultaneous operations on a non-contiguous battlefield, joint, combined, and interagency operations, heavy, light, and special forces operations, and active, reserve, and civilian components participation.

The military and society at large are in an era of transition between the industrial age and the information age that has been characterized as a revolution. This transition is fraught with conflict, denial, and yearnings for a seemingly simpler, more familiar, past. This includes a dangerous tendency that seeks to refight past and not future conflicts. This transition, and the changes it causes, will be resisted both internally and externally by the military and by society and culture at large. Overcoming the natural resistance to change and the friction it causes is a necessary and long-term effort.

As described historically above, the gains of the present are reversible and technology is no guarantor of progress or continued success.

Computers, networks, and information systems will grow as tools to support battle command, as they have to support decision making and decision support in corporate America.

Lastly, it is assumed there will be no radical or quantum breakthroughs in technology over the next several years. Though science fiction provides exciting visions of the future, this study limits itself to possibilities for which at least enabling technology currently exists. For example, computer chips may become faster and cheaper, but cold fusion and a Star Trek-like "transporter" and similar breakthroughs are unlikely before 2010.

Questions

> The right question is usually more important than the right answer to the wrong question.[6]
>
> Alvin Toffler, *The Third Wave*

The primary question for this paper is how can maneuver brigades train and educate excellence in the execution of twenty-first century battle command in home station training? Subordinate questions are as follows:

What will battle command in the twenty-first century look like? This question looks specifically at 2010 and beyond, as opposed to the simpler task of looking forward a mere year or two. In long range planning it is necessary to first look at requirements, or

to identify problems, and then resource, adapt or invent the necessary means to accomplish the task.

What resources are and will be available to train and educate? Requirements must drive technology, not the other way around. From the requirements developed in the first question, the next question is to determine what means are available to address these requirements. Tasks and requirements must be technically feasible. If feasible, but not currently possible, additional research, development and resources should be devoted to developing new and imaginative solutions.

What areas of battle command are traditionally and historically weakest at the brigade level? Will these problems carry over into the future, or can technology help to solve old problems? In solving old problems, will technology create new and different problems?

How have armies adapted to new technology in the past? There is nothing new under the sun. The issues faced today have been faced in one form or another either in America's past, or in the past of other armies and cultures. How can these lessons be placed into a proper and applicable context to apply them to twenty-first century battle command?

How can new educational theories and concepts, such as cognitive learning, active learning, experiential learning and the role of simulation be integrated into training of battle command at the brigade level?

How will professionals identify, disseminate and learn the evolving lessons from current experiences in real operations as well as live and virtual simulations? How can students and instructors ensure continuous visibility of new lessons in the rapidly changing and uncertain environment of future tactical operations? How will brigades keep Clauswitz's "fog of war" from being replaced by an equally disabling overload of information?

Methodology

Looking into the future is a dicey business. The first focus will be to look at facts and not fantasies to guide a plausible guess of the future. Looking into the future is exactly what a commander and staff, assigned to plan and execute an attack seventy-two hours hence, must do. They fall back on training, experience, standard procedures, and as much information as is available to develop viable and feasible courses of action. They do not expect to get it 100 percent right and realize the truth of von Moltke's dictum that no plan survives first contact with the enemy.

The method or scheme of maneuver for studying the primary thesis question is in three phases, as illustrated in figure two. First is an examination of the evolution, training, education, and key events of battle command in a historic context. The period of transition for the U.S. and German Armies to mechanization in the 1930s and the present transition to digitization of the 1990s provide historic parallels and a context in which to view the future. By examining a previous period of transition in technology and military

thinking in the not too distant past, this paper will develop a solid foundation on which to project future of battle command.

The second phase looks at the more specific strengths and weaknesses of present day battle command. Assessments are drawn from observed and demonstrated performance at the CTC and BCTP and documented through personal observation, interviews with past and present leaders, observers-controllers (O-C), opposing forces (OPFOR) soldiers from the training centers, and the Center for Army Lessons Learned (CALL).

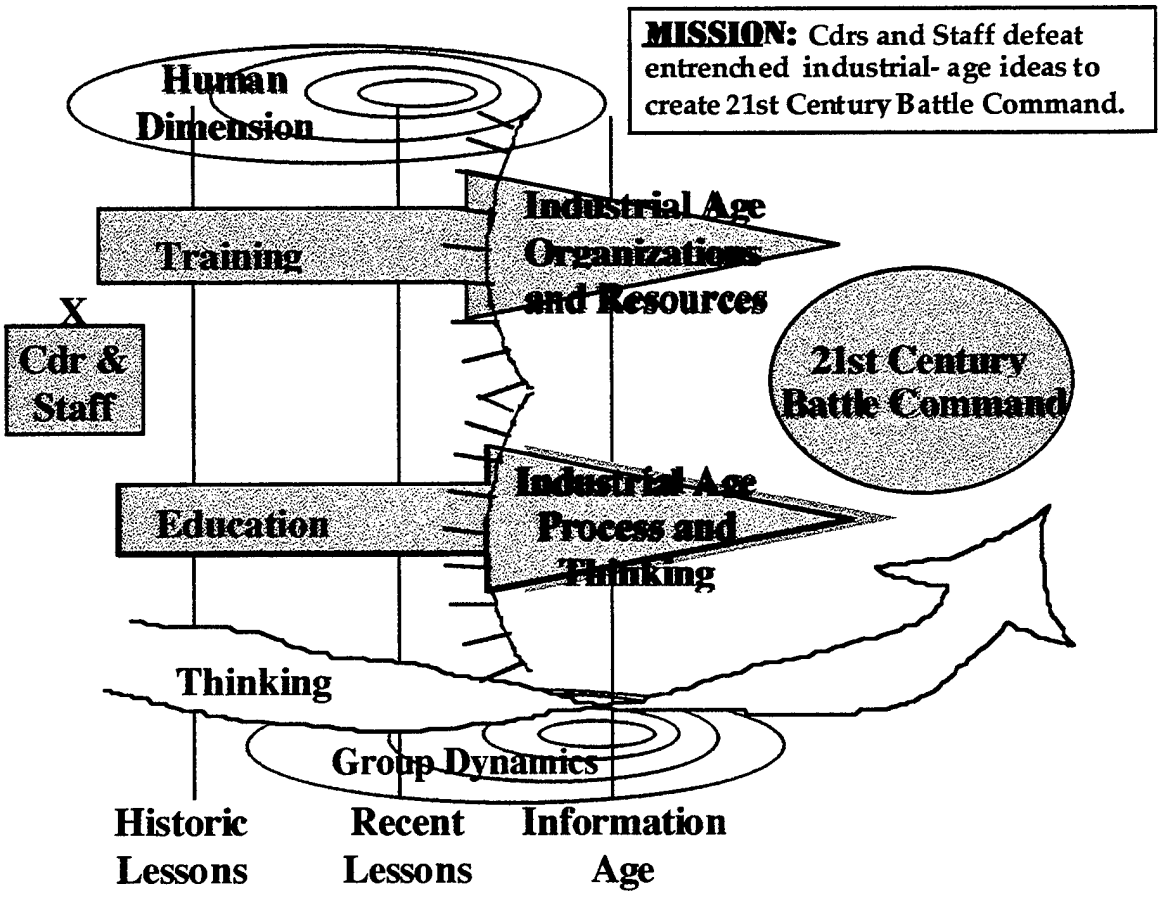

Figure 2. Scheme of Maneuver

The last phase analyzes the information gathered against a background of the broader issue of society's transition from the industrial age to the information age.

The evolution or revolution that faces the military also faces educational, governmental, and business institutions each of which has to cope with training and educating their leaders, staffs and "soldiers" to think and be effective against future competitors and adversaries. Each must learn to adapt to a new spectrum of the ways in which technology can be adapted to the training, education, and execution of battle command.

From the above foundation this paper will build an analysis and draw conclusions about the structure of twenty-first century battle command and the ways to train and educate brigades at home station. The analysis and conclusions will include the human dimension, and the six dynamics of battle command.

Though both the commander and staff contribute in varying degrees to each dynamic in broad terms, leadership and conceptualization more involve the commander. The detailed work of decision making and visualization are more the responsibility of the staff (though the commander must visualize to develop his concept). Assimilation and communication are key links that help provide a common view and understanding of the battlefield between the commander and staff internally and higher headquarters, subordinate, and adjacent units externally.

The primacy of the commander in conceptualization and leadership, and the lessor but shared role the staff plays in these areas, as well as the staff primacy in providing the

products and detail work necessary for visualization and decision making is shown graphically in figure three.

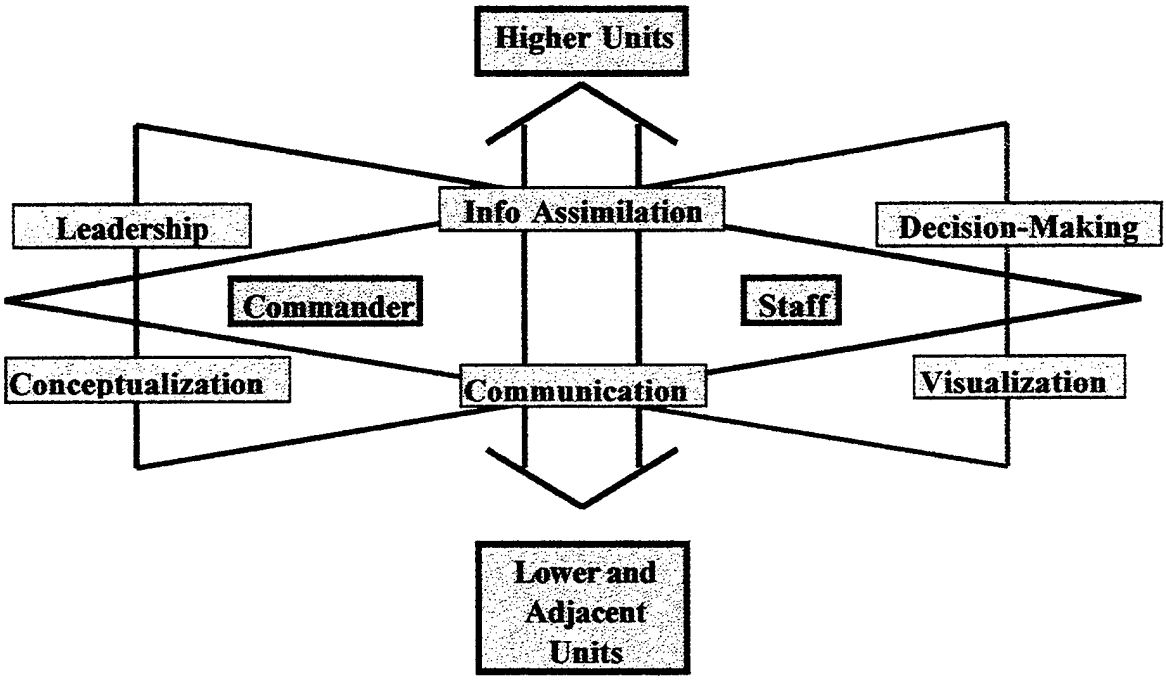

Figure 3. Relationship of Six Dynamics to Commander and Staff

Historical Perspective

> In forming the plan of a campaign, it is requisite to foresee everything the enemy may do, and be prepared with the necessary means to counteract it.[7]
>
> Napoleon

In 1932 then Major George S. Patton Jr. observed that "the human mind prefers to remember, rather than think . . . ."[8] He argued that this leads to an excessive "veneration" of the past to the point many believe it depicts the future. He called for a

longer view, saying that there are recurring cycles of history that merit examination, stating, "Without perspective, a painting is valueless; so it is with things military."[9] The same sentiment is expressed today by Microsoft CEO Bill Gates, who says success is "an unreliable guide to the future," adding that "history is a good teacher, though."[10]

The history of the transition to mechanization of the U.S. and German armies in the 1930s and the evolution of thinking from World War I to the tremendous impact of the internal combustion engine on military operations provides a relevant historic perspective and lessons that can be applied in the appropriate context to our ongoing transition to digitization. It can provide the perspective needed to assimilate the impact of the silicon chip on present and future operations.

This portion of the study focuses on the key events and individuals of that period to develop the historic context in which to view the present transition to digitization in the 1990s and beyond. The Louisiana Maneuvers stand out as a major event in developing and training U.S. forces to respond to the new tactics of blitzkrieg. Though this paper looks at the brigade level, and the maneuvers were documented at division and corps, the increased lethality of brigades, as well as a communications infrastructure that surpasses those of World War II divisions, provides a parallel between present-day brigade and past division and corps battle command. The Louisiana Maneuvers were a key exercise in adapting to the then new tactics of the internal combustion engine and provide valid perspective on the current challenges of adapting to the computer chip.

Both George S. Patton Jr. and Erwin Rommel stand out as skilled practitioners of the art of battle command during this period. The key experiences and the system of education which helped produce military minds able to make the conceptual leap from horse cavalry and dismounted infantry to the more holistic tactics of blitzkrieg are relevant to this study.

In the words of one German theorist, the father of a World War II general, "Military history is . . . a careful teacher who, if we are attentive, allows us to view and grasp matters, which we have never before been in a position to see, but which, nevertheless, are liable to confront us in the same, a similar, or a changed form, and demand unpremeditated, instant and decisive action, entailing heavy responsibilities."[11]

This chapter also examines the historical context and key individuals in the development of and response to blitzkrieg. Looking first at its conceptual father, Heinz Guderian, it then examines George C. Marshall's innovative response to the need to rapidly train and educate American forces to this new tactics--the Louisiana Maneuvers.

Battle command is not the act of an individual, but involves the staff and the units which provide the means with which to execute battle command. For perspective, this chapter also looks at the personalities, procedures and staffs of the Third U.S. Army and other staffs and reviews them for applicability to this study.

Present Day Perspective

> Prejudice against innovation is a typical characteristic of an Officer Corps which has grown up in a well-tried and proven system.[12]
>
> Erwin Rommel, *The Rommel Papers*

> The only thing harder than getting a new idea into the military mind is to get an old one out.[13]
>
> B.H. Liddell Hart, *Thoughts on War*

Though the initial research focuses on history, it is important to avoid the danger of looking backwards and preparing to refight old battles and to focus on the future.

Lessons learned from the CTCs show recurring deficiencies in the ability of commanders and staffs to apply lessons from both the recent and distant past in battle command. They range from problems as simple as the inability to track friendly and enemy units on the battlefield, the information dissemination and exchange necessary to maintain a common picture of the battlefield[14] to broader problems in the management and execution of planning and synchronization of the multiple battlefield operating systems (BOS) under the control of a brigade commander and staff.[15]

The wealth of lessons learned data is a tremendously valuable asset to trainers and educators alike (as well as to our potential adversaries). How well brigades are able to use and integrate this data into home station training will be considered, as well as whether or not the format of this particular database is optimized to assist training at that level, or if it is focused on other purposes.

Whether or not existing data and resources can be leveraged to provide new and innovative means to assist brigades in training and education of battle command will be explored in this chapter.

Industrial Age to Information Age Transition

This chapter applies expertise from the private sector in coping with the challenges posed by transitioning people, data, and resources to new and more innovative training and education and to a new way of looking at the world. The world at large in which future brigades will operate is the same one businesses face. When management guru such as Tom Peters ask questions like How do you manage the human imagination? the impact these same issues could have on the Army should also be considered. As more and more soldiers gain access to information through the internet and other tactical information systems, brigades will face the need to address the "power shift" alluded to by Alvin Toffler when he argues that as knowledge is redistributed, so too is the power based on it.

It includes a look at the broader geographical context and the more fluid, force projection environment in which our forces will operate.

This includes more Asian and third world nations, and a paradigm shift from the European-oriented theories of Clausewitz and Jomini to the works of theorists such as Sun Tzu and Che Guevara. The new terrain which commanders and staffs must visualize will grow to include terrain of the mind and psychology. This is hardly a radical thought when one considers the words of a German military theorist who wrote in 1908 that "Tactics is psychology."[16]

The psychology and human dimension this study considers include not only potential adversaries, but future leaders and soldiers as well. The enlisted soldiers of

2010 are today in elementary school. Their non-commissioned officers (NCO) and junior officer leaders are now in high school, and their field grade and senior NCO leaders and battle staff members are today in college or are young enlisted soldiers and Lieutenants. They are exposed to and familiar with a much higher level of technology than past generations--and current leaders. They are fed a constant diet of information in images and sound as well as more traditional means that exposes them to new or simply different ideas and leaves them less reliant on or more suspect of traditional wisdom and authority. It is unclear whether the challenge of the future will be keeping their attention, keeping up with them, or both. How will educators and leaders focus their energy without stifling their imagination and initiative?

They will have used computers and other technology throughout their school years, again, much more so than current leaders. Their music is on CD ROM or other high storage digital disk, rather than the antiquated vinyl discs the current generation of leaders may still have in boxes in their attics or basements. They will see the shift from current to High Definition Television as the current generation witnessed the shift from black & white to color television. They will view technology differently, and deserve a training program tailored to their needs and capabilities and not one dumbed-down to the skills of their teachers. Such an effort is clearly a long-term effort. This paper is a thought piece to help get the ball rolling now to exploit the potential that exists.

Changes will not occur without new ideas. A briefing to a Command and General Staff College (CGSC) class by a retired general officer stated that the current error rate in

the Army's personnel inventory systems is as much as 3 percent. Such rates would not be tolerated by Wal-mart or L.L. Bean in their inventory systems. This alone is a telling indicator that the brigades of 2010 will need battle command training that better exploits current thinking and education to allow future leaders and soldiers of this new force to achieve the higher levels of competency in battle command that technology gives us the potential to attain.

Technological integration is achieved both physically and mentally. New ideas, doctrine, tactics, and applications often lag behind the development of new technology. The one who invents or holds the best current technology is not always guaranteed of future success. Motion picture inventor Thomas Edison lost out to Hollywood studios who made more profitable use of his technology, and communications monopoly Western Union tried to use their dominant market position to crush the fledgling Bell Telephone Company in the late nineteenth century.

As discussed by Drs. Alvin and Heidi Toffler in their 1980 work, *The Third Wave*, the corporate world will continue to shift from hierarchical to matrix and networked organizations that are not wholly compatible with current military practice. Against this background of internal friction and conflict must be balanced a realization that new doctrine and tactics are still evolving, and the mental agility needed to maneuver on this new terrain will require breaking old and perhaps to some, sacred rules. The first rule of war in George Marshall's *Infantry in Battle* paradoxically stated that "Combat situations cannot be solved by rule."[17]

In warning that there is no formula for solving tactical problems, and that each is unique, the author opines that experience and training is needed to develop competence in the tactical art, as well as "elasticity of the mind"[18] needed for successful battle command A former combat commander and commander-in-chief echoed this sentiment when he stated "If men make war in slavish obedience to rules, they fail.[19]"

Definitions

Battle Command. The art of battle decision making and leading. It includes controlling operations and motivating soldiers and their organizations into action to accomplish missions. Battle command includes visualizing the current state and a future state, then formulating concepts of operations to get from one to the other at least cost. It also includes assigning missions, prioritizing and allocating resources, selecting the critical time and place to act, and knowing how and when to make adjustments during the fight.[20]

Combat Training Center (CTC). The program of four training centers, the National Training Center (NTC) at Fort Irwin, California, the Joint Readiness Training Center (JRTC) at Fort Polk, Louisiana, the Combat Maneuver Training Center (CMTC) at Hoehenfels, Germany, and the Battle Command Training Program (BCTP) at Fort Leavenworth, Kansas that provide active and reserve forces with hands-on training in a stressful, near-combat environment.

Home Station. Active Duty, Reserve and National Guard units in a garrison environment at their permanently assigned post, camp, or station in proximity to where

their tactical equipment is stored, their soldiers live or are billeted, and where they conduct day-to-day operations on a daily basis or while in normal drill status.

Maneuver Brigades. Tactical units with a combined arms composition and capability which currently form the basic building blocks of maneuver divisions, and which regardless of whether or in what form divisions exist in 2010 and beyond, can be expected to serve as the basic building block of tactical formations and missions well into the next century.

Literature Review

Chapter 1, "Introduction"

The purpose of this paper is a look at training in the world of 2010, and therefore requires a look into the future. There are ample works by futurists to provide a reasonable basis for looking into the future. Most notably are the writings of the Tofflers. Their 1970 work *Future Shock*, laid the foundation for futurists and remains one of the most noted works of this genre. Where one-hundred years ago men had to look to the works of Jules Verne and H. G. Wells to get a glimpse of the future. The works of modern day futurists have brought this topic from the fanciful world of science fiction to the more respected one of nonfiction. The Toffler's trilogy of *Future Shock, Power Shift*, and *The Third Wave* is an important part of the foundation literature used for this paper. It is a tribute to the Tofflers and their relation and relevance to the military that they have spoken at such institutions as the U.S. Army Intelligence Center, the Army War College, and other military schools and institutions. They have also participated in seminars and

symposiums sponsored by various agencies of the U. S. Armed Forces and Federal Government. Their work with the Training and Doctrine Command (TRADOC) in the early 1980s led to the work *War and Anti-War*, which traced the evolution of discussion and ideas in the early 1980s to the battlefield realities in the execution of Operation Desert Shield/Desert Storm in 1990 and 1991. This is only one example of the utility and practicality of long range planning and visualization of the future to insure and assure future success.

The Tofflers are of course not the only futurists. Dr. Samuel P. Huntington is often portrayed as a counter to the Toffler's theories. His article "The Clash of Civilizations" in the Summer 1993 issue of *Foreign Affairs* provided an alternate view of the future to the one presented by the Tofflers. Rather than following Toffler's arguments that future conflicts can be characterized as following tactics of three "waves" of civilization, the agricultural, industrial- and information-ages, Huntington believes conflicts will break down along cultural or religious lines. Regardless of the paths these authors choose, both agree that the role of the U.S. as the world's lone superpower will not eliminate conflict in the future and that the nature of conflict facing the U.S. in the future is likely to change.

Following similar lines to Huntington's work is the article "The New Warrior Class" by Ralph Peters, which he presented in the Army War College's *Parameters* in the Summer of 1994. "The Coming Anarchy" by Robert D. Kaplan continues along a similar thread.

Chapter 2. "Historical Perspective"

The introduction of the internal combustion engine and radio ushered in a new age in warfare in the 1930s known as blitzkrieg or lightning warfare. Though this era is well documented, the focus in this chapter is to draw parallels between how the internal combustion engine's revolutionizing of war in the 1930s provides lessons and parallels of how the silicon chip will continue to revolutionize warfare into the next century. The voluminous work *Tactics* by Colonel William Balck of the German Army in 1908 is significant in its effort to help the German Army modernize and its use as a text by the next generation of German officers who went on to develop, refine and execute blitzkrieg. It is also significant for it's indirect impact on the training of the U.S. Army that would have to adapt to counter the new war form. It was translated in 1914 by then First Lieutenant Walter Krueger, who would later go on and serve as an exercise director for the Louisiana Maneuvers. Original source documents from the maneuvers provide strong evidence of parallels between the challenges and opportunities presented by new technology, as well as evidence that many, perhaps since ignored by history, saw new technology as nothing more than business as usual.

The British Lord Kitchener, a hero of the Sudanese and Boer Wars, derisively labeled the tank little more than a pretty mechanical toy after observing tank tests in 1915. His past experience, training and education did not prepare him to visualize or even imagine the future potential of new technology that would change the world of warfare just twenty-five years later.

Chapter 3. "Present Day Perspective"

A wealth of information is available on present day operations, from the extensive CALL database, to interviews with others who have serves as observer-controllers (O-C) at any of the CTCs or in BCTP. Recent works from CGSC and the School of Advanced Military Studies (SAMS) touch on battle command and include John Antal's *Combat Orders: An Analysis of the Tactical Orders Process*, and similar works. *Into the Storm - A Study in Command*, coauthored by Tom Clancy and General (R) Fred Franks also provides valuable perspective on present day issues.

Chapter 4. "Industrial Age to Information Age Transition"

A valuable sources for looking at how the private sector is dealing with the same transition which the military faces was a worldwide teleconference on "Shared Leadership in the New Workplace: Thriving on True Teamwork" held in October, 1997. Sponsored by *Fortune* magazine, the two-day seminar included such business luminaries as Peter Drucker, Tom Peters, Stephen Covey, Ken Blanchard, Peter Senge, and other noted business experts and authors. A panel discussion between several Chief Executive Officers (CEOs) of *Fortune* 500 corporations also added to both the seminar and to the perspectives on how the private sector is moving toward the twenty-first century. Some of the books written by participants in the seminar include Peter's *Thriving on Chaos: Handbook for a Management Revolution,* Senge's *The Fifth Discipline: The Art and Practice of the Learning Organization,* and others. Another book from the business genre that contributes to this study is *The Road Ahead* by Bill Gates. Some extremely thought-

provoking books that help bring this discussion back to a military perspective is provided by Colonel Douglas MacGregor's *Breaking the Phalanx: A New Design for Landpower in the 21st Century*, Alvin Toffler's *War and Anti-war: Survival at the Dawn of the 21st Century*, and Lieutenant General (R) Frederic J. Brown's *The U.S. Army in Transition II: Landpower in the Information Age.* These publications, along with a host of past and current articles from a variety of periodicals, provide a more than adequate base from which to examine the selected topic.

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[1] Theodore Roosevelt, Graduation Address at the U.S. Naval Academy, Annapolis, Maryland, June, 1902.

[2] Thomas E. Griess, ed., *Ancient and Medieval Warfare* (Wayne, New Jersey: Avery Publishing Group, 1984) .

[3] Albert Einstein; quoted in Jon Winokur, ed., *Zen to Go* (New York: Penguin Books, 1990), 106.

[4] John F. Kennedy, Speech at Boston College, 20 April 1962; quoted in Robert L. Polley, ed., *American the Beautiful* (Elm Grove, Wisconsin: Country Beautiful Foundation, 1964), 48.

[5] Aristotle, *The Nicomachean Ethics* as quoted by Steven Covey, *The Seven Habits Organizer* (Covey Leadership Center, 1995)

[6] Alvin Toffler, *The Third Wave* (New York: Bantum Books, 1980), 6.

[7] *FM 34-130 Intelligence Preparation of the Battlefield* (Washington, D.C.: HQ Department of the Army, 1994), 1-1.

[8] G.S. Patton Jr., *The Probable Characteristics of the Next War and the Organization, Tactics and Equipment Necessary to Meet them* (Washington, DC: Army War College, 1932), 1.

[9] G.S. Patton Jr., 1.

[10] William Gates III, *The Road Ahead* (New York: Penguin Books, 1996), 38.

[11] William Balck, *Tactics*, Translated by Walter Krueger, (Fort Leavenworth, Kansas: U.S. Cavalry Association, 1911), 8.

[12] Erwin Rommel, *Rommel Papers*, ix (1953); quoted in Robert Debs Heinl Jr., ed., *Dictionary of Military and Naval Quotations* (Annapolis, Maryland: U.S. Naval Institute, 1966), 190.

[13] B.H. Liddell Hart, *Thoughts on War*, v (1944); quoted in Robert Debs Heinl Jr., *Dictionary of Military and Naval Quotations* (Annapolis, Maryland: U.S. Naval Institute, 1966), 190.

[14] *CTC Trends, 1st Qtr 97 & 2 Qtr 97* (Fort Leavenworth, KS: Center for Army Lessons Learned).

[15] Jon J. Fallesen, *Overview of Army Tactical Planning Performance Research* (Fort Leavenwroth, Kansas: U.S. Army Research Institute (ARI), 1993)

[16] Balck, vi.

[17] *Infantry in Battle* (Washington, D.C.: The Infantry Journal, [1939]), 1.

[18] *Infantry in Battle* 1.

[19] U.S. Grant; quoted in John Russell Young *Around the World with General Grant*, (New York: New York Herald, 1879); available from http://www.mscomm.com/~ulysses/page43.html; Internet; accessed on 1 June 1998.

[20] *FM 100-5, Operations* (Washington, DC: HQ Department of the Army, 1993), Glossary 1.

CHAPTER 2

HISTORICAL PERSPECTIVE

> There are lessons, of course, and when people speak of learning from them, they have in mind, I think, two ways of applying past experience: One is to enable us to avoid past mistakes and to manage better in similar circumstances next time; the other is to enable us to anticipate a future course of events.[1]
>
> Barbara Tuchman, *Practicing History*

This study begins with a foundation in history to provide perspective on how the U.S. and other armies have made technological transitions in the past and adjusted training to account for these changes. In looking toward the future, comparing past events with similar current events helps us to use the past as a crude but effective measuring stick with which to gauge the future. The military evolution and observations on the institutionalization and training of mechanized warfare made possible by the internal combustion engine helps show what more is needed to institutionalize and train battle command in the new environment of digital warfare.

In his 1932 War College paper on what would be needed in the coming war--which he rather accurately predicted almost ten years before it occurred--George S. Patton Jr. examined almost 4,000 years of warfare to show broad trends in warfighting between wars of mass and wars of maneuver. He hypothesized that armies historically varied between ones of mass, which emphasized quantity over quality and professional armies, which emphasized quality over quantity.[2] He noted with disdain that there were those in

the U.S. Army who believed there was no value in studying history prior to 1870 due to changes in weapons and technology.

Patton, however, forcefully stated the case for studying military history. "Without perspective," he said, "a painting is valueless; so it is with things military."[3] The point and purpose of studying military history, he explained, is not to imitate the tactics of old, but rather to understand them in context and learn the recurring themes and patterns that history presented which can be applied to both the present and future. Though the technology of war changed many times over the 4,000 years covered by his study, the men who fight wars and wield the technology had not. Patton said that "save for appearances the hoplite and the rifleman are one."[4]

Patton's view on the utility of history in military education had its proponents in other armies as well. "Military history is for us the principle source from which to gather knowledge,"[5] wrote German tactician William Balck in his pre-World War I work *Tactics*. Training and education include many facets. There are limitations to map and field exercises that only history or actual combat experience can fill. Balck continues that "one must learn the conduct of war from the experience of others; one's own experience is costly and is almost invariably gained too late."[6]

In examining future warfare from his historical perspective in 1931, Patton believed the introduction of the new (and expensive) technology of mechanization called for a professional army rather than one of mass. He placed great emphasize on the thorough and detailed training of this force to allow it to gain advantage on the battlefield.

He noted that a smaller, better trained and equipped force could defeat a larger force, stating, "against a reasonable superiority in numbers the superior training and technical ability of the regulars insures victory."[7] While Patton was exploring the future of warfare the German Army, and one German officer in particular, was beginning to put theory into practice and honing the leading edge of the new form of warfare into the tactics of blitzkrieg.

Guderian and Blitzkrieg

Understanding Heinz Guderian's success in making the mental leap from the static, linear, infantry battles of World War I to the fast-paced and dynamic tempo of lightning warfare requires first a broader view of the German Army and the system which helped produce the soldier he became. In his book *A Genius for War* Colonel (R) T.N. Dupuy makes clear that the excellence of the German Army was not the result of some innate traits in the German soldier.[8] Rather it was the result of planned institutionalized military excellence.[9] A key element of this institutional excellence evolved in the early 1800s by Scharnhorst following the destruction of the army at Jena by Napoleon. He created a centralized General Staff of carefully selected and highly trained professionals to do the thinking and planning at the highest levels of the Army. From this system also evolved a system for training excellence in thinking and planning at the tactical levels of the Army as well.

With a growth in population and an inability to afford an expansion of the professional army reserve forces were created and expanded. Annual fall maneuvers were

instituted to ensure the readiness of the reserve forces to operate with the active forces.[10] To prepare officers for the mental challenges of these exercises, the Chief of Staff of the German Army instituted a new form of war gaming or *kriegspiel* as a training tool throughout the entire force. War games based loosely on the game of chess were used in the French and Prussian military since the 1700s. Though they provided the mental stimulation of chess their use of a checkerboard-like surface made them more a game and less than suitable for the training of commanders and staffs.[11] In the 1820s, however, an effort was made to improve the realism of the games. A major improvement in the new version was replacement of the checkerboard surface with a tactical map. This more accurate view or visualization of the simulated battlefield of the game improved realism. While observing a game played by Prince William (later Emperor William I) and some of his fellow officers, the Chief of Staff of the German Army observed that, "It is not a game at all. It's training for war! It is of value to the whole Army."[12]

Though initially adopted as a planning tool by the General Staff, it soon grew to be instituted throughout the entire army as an entertaining and valuable form of training. At lower unit levels the game used sand tables along with maps to provide better graphic representation of the battlefield. It was used not only to train teams of commanders and staff officers, but their NCOs as well. Written orders were integrated into the training. "The essence of *Kriegspiel*, as developed by the General Staff, was the opportunity for officers to operate together as a team of commanders and staffs in dealing with realistic combat situations on maps which might or might not represent actual terrain."[13]

Guderian emerged as both a prodigy of this system and a victim of it. Though the system provided him a solid educational background on which to build his career and develop an intellectual base for developing changes, the very success of the system served as a guardian against change. This provided both resistance and frustration to Guderian as he sought to develop the potential of the internal combustion engine into the tactics of blitzkrieg.

Though trained as a light infantryman, Guderian actually spent his first several assignments both before and during World War I as a signal officer. He was assigned to positions in command of radio and telegraph units. These assignments gave him experience in the use and misuse of new technology. He experienced higher commanders who did not understand the capabilities and limitations of the new technology. This experience influenced him when developing the tactics of a mechanized force. In an ironic twist he also unwittingly helped demonstrate the double-edged nature of technology. Assigned to a cavalry corps, his unit received and transmitted orders and messages for units to exploit a gap between British and French lines that developed in the early days of the war. French forces, however, had cracked the German code and were monitoring their radio transmissions. French commanders were aware of the gap and German actions almost as soon as the Germans.[14] Shortly after this incident the lines stabilized and forces on both sides settled in for four years of trench warfare.

Guderian was so bold as to chastise his division commander for failing to understand how to properly use his radio/telegraph company and almost getting he and

his soldiers captured by the French.[15] His experience with the integration of this new system was not unique to this division or even this echelon. Guderian biographer Kenneth Macksey observed that "a failure to resolve basic misunderstandings between an infant technological weapon system and the General Staff's established practices lay at the heart of the trouble; yet it was merely typical of the problems normally associated with initiating any new and powerful weapon to best effect in the teeth of reactionary and entrenched practices and opinion."

The German General Staff was a victim of its own success. Victories in 1866 and 1870 developed confidence in existing procedures, but also served to stifle new ideas and new thinking. A major German weakness was the vulnerability of their radio traffic to interception and use by allied intelligence services. Both the army and navy experienced this problem with the new technology. This was only one example of a blind spot to new ideas, new thinking, and new perspectives. Another was the failure to even explore the development of tanks--new technology developed by the allies to break the stalemate of trench warfare. The initial allied success at Cambrai in November 1917 highlighted a lack of foresight and problem-solving technique.

Where the allies sought a primarily technical solution to the problem of the trenches the German General Staff sought a purely tactical one, trying to optimize existing technology and equipment.[16] Each method had both success and failure. Guderian showed the paradigm shift of combining both new technology and tactics.

Following assignments as a signal officer he also served as an intelligence officer. Here he gained more practical experience in new technology as he explored the use of aircraft for reconnaissance. He was one of only a few non-aviators to actual fly in these new machines and gain an appreciation of their potential. His personal hands-on experience both broadened his perspective and contributed to his future ability to conceptualize the development of mechanized tactics. Other experience which contributed to his diverse background and strong conceptual ability included time as a supply officer, as well as his training and experience as a light infantryman.

In 1917 he attended the General Staff Officer's Course at Sedan. As an added benefit he had the opportunity to physically survey and familiarize himself with the terrain where he would maneuver twenty-three years later when he would put into practice his soon to develop theories of mechanized warfare.[17] His expertise and developing reputation as an innovative thinker earned him a post-war assignment studying mechanization for the German Army. His knowledge base included not only a varied range of type assignments and a solid historical and theoretical background, but also the fortuitous luck to have been present at several of the major engagements of World War I.[18]

Though Guderian is historically credited as the father of blitzkrieg, valuable teamwork and mentorship from his battalion commander following his assignment to a Motorized Transport Battalion in 1922 assisted him. Here he began his work on doctrine and organization for motorized troops. Guderian and Major Oswald Lutz developed a

relationship, which they maintained for many years. Lutz was a railroad engineer by training and worked to improve Guderian's technical training and basic understanding of the issues of motorization.[19] Here he was able to build on a base of historical and theoretic knowledge in which the railroad rather than the motor car served to provide mobility for the army. German victories against the Austrians in 1866 and then the French in 1870 were facilitated by the use of railroad and telegraph to mobilize and deploy Prussian forces.

Prussian tactics and their employment of technology, however, and not the technology alone, led to victory. The French actually had superior rail and telegraph networks to those of the Prussians.[20]

Though his service with radio/telegraph units gave him an appreciation of this and other new technology and its immense potential, Guderian and others in the embryonic motorized troops faced friction and disdain from traditional combat arms soldiers. Macksey, who himself served in the British Royal Tank Corps, observed that "in every army, there yawned a gulf between specialists and regimental and staff soldiers, a gulf that was exceptionally wide in the German Army due to a common contempt for 'rude mechanicals'."[21] These challenges of dealing with those who did not share his vision of the future potential of new technology and remained wedded to old ways of fighting extended all the way up to the General Staff.

Guderian gained valuable experience during field and map exercises in 1923-24 in maneuver of motorized forces, but when he attempted to share his vision of a combat role

for motorized forces with an inspector from higher headquarters was curtly told motorized forces were for "carrying flour." and nothing more.[22] His persistence and tenacity, as well as the demonstrated power of new technology, would help change this thinking but only after many years of hard work.

His next assignment contributed greatly to the mental work of developing and conceptualizing his vision of a new form of warfare. As an instructor of tactics and military history he combined both personal preference and experience to develop a curriculum that educated at a level that would result in the students understanding his lessons, rather than just being able to repeat them. He described his new post as one that "entailed a great deal of work; my audiences, too, were highly critical in their attitude, so that the exercises I set them had to be very thoroughly thought out, the solutions most carefully considered, and the lectures I gave clear and thorough."[23]

Rather than choosing to teach lessons through a review of German victories, Guderian instead used defeats as a means of instruction. Von Schlieffen in an earlier age sought to use historical examples to illustrate his theories of attack, focusing on victorious battles. Guderian noted that though von Schlieffen's examples were successful battles they did not necessarily lead to victorious wars. His use of examples of defeats, to include that of World War I, illustrated his point of the need for change rather than a revision of the status quo.[24] His use of history also helped develop the mental agility, which his new form of warfare would necessitate. Balck explained that military history not only "prepares in advance the mental balance necessary at the moment of action; it

should also prepare for the unexpected."[25] Guderian's service as an instructor was not limited to the platform, and it gave him frequent opportunities to expound on and further develop his ideas in tactical exercises and war games.

The General Staff during this period also underwent a study of the defeats of World War I and some of these staff officers began to arrive independently at many of the same conclusions as Guderian. Mobility and the use of air power would be key in future conflict. In addition to Guderian's works on motorization, arrangements were made with the Russians to provide training ground where practical work with mechanized forces could be conducted without running afoul of the Versailles Treaty.[26]

As he expanded his studies and interest from motorization to mechanization and armor operations, he also expanded his reading and research. Guderian drew particular inspiration from the works of the British officer J.F.C. Fuller and closely studied British exercises with armor. His willingness to study not only his own doctrine and history, but those of his enemies as well helped broaden his base of experience. The British were the world leaders in armor at this time. A 1927 exercise on the Salisbury plain pitted a combined arms mechanized force against a larger force of horse cavalry and defeated it.[27] Though this helped validate his own theories, he continued to dig deeper and saw different lessons. He realized that though technologies advance was making new applications of tactics and the development of new doctrine possible, more work was needed to realize the evolving potential. He saw that the tank could not achieve decisive victory alone. From German maneuvers and the British exercise, he concluded that "tanks

would never be able to produce their full effect until the other weapons on whose support they must inevitably rely were brought up to their standard of speed and cross-country performance."[28]

Despite growing indications of the potential of armor forces, changes in thinking were still slow to come. Where Guderian was able to conceptualize the ultimate potential of mechanized and armor forces as well as see the problems and solutions necessary to realize this potential, others could only see the problems. In 1931 a retiring General Officer told Guderian "You're too impetuous. Believe me, neither of us will ever see German tanks in operation in our lifetime."[29]

A major conceptual hurdle involved whether tanks were infantry support weapons or a new arm of service. Though many status quo thinkers were willing to accept the tank in a support role, the territorial nature of bureaucracies and hierarchical organizations confronted Guderian with much stiffer resistance to the idea of a new arm of service. Branch loyalties and personalities played a role as Guderian tried to win a new and unique role for the combat potential afforded by mechanized operations. As would later be seen in the United States, the cavalry branch emerged as a competitor to mechanized forces. Though battles over resources and manpower continued, the cavalry branch during a reorganization finally conceded a role for mechanized forces in operational reconnaissance. Though only part of the role Guderian envisioned, he trained, organized and equipped forces to perform this mission. When a new Chief of Cavalry was assigned--one who came from an infantry background--he tried to return the operational

reconnaissance mission to his branch and take it away from motorized troops. This act would also have given him charge of the new armor technology, and most likely have seen the evolution of the tank in the German Army as a support weapon.

The clash of ideas and opposing visions generated conflict. "The arguments often became extremely heated," said Guderian, "But finally the creators of fresh ideas won their battle against the reactionaries; the combustion engine defeated the horse; and the cannon, the lance."[30] Despite Guderian's bravado the battle, of course, could easily have gone the other way. Having new technology is no guarantee it will be employed in an optimal configuration. In many eyes Guderian, and not the infantry and cavalry officers with whom he argued, would be considered the reactionary. In the French Army, which had technologically superior tanks to those of the Germans, the tank was considered an infantry support weapon. Their concept and vision for this new technology resulted in doctrine and tactics geared to the pace of an infantryman, rather than the maneuver warfare that Guderian envisioned.[31] As with the Maginot Line, new technology was applied to perfecting the doctrine and tactics of past wars. Each side felt it was taking the correct path. At the time, it was not clear if the future would be an update of the past or something completely different. It would ultimately take war to prove which method was best and whose vision of the future was the correct one.

With time and persistence, the tide in the German Army slowly turned in favor of Guderian and his new ideas. He was aided by the fact that his former battalion commander, Major Lutz, was now a general officer and still involved in the mechanization

efforts. In 1932 maneuvers were held to put the concept of armor/motorized operations to the test. Negative comments submitted by the cavalry branch were viewed as "petulance,"[32] and a number of younger cavalry officers came over to Guderian's way of thinking, realizing that "the true and tried principles of cavalry warfare were only still valid if the cavalry were equipped with new weapons and methods."[33] Yet there were still those who clung to old weapons and tactics, perhaps better able to understand the more mechanical tasks of deploying their horses and other equipment than to grasp the more conceptual tasks of cavalry maneuver. Others may likewise have been unwilling or unable to make the mental leap or synthesis of applying cavalry style tactics at speeds and ranges well beyond the more familiar pace of the horse.

With the election of Adolph Hitler as German Chancellor, Guderian received the opportunity to brief the national leader on the progress of motorization and gained invaluable support for his plan. Development of theory and tactics continued as German industry began work in earnest to gear up to meet the requirements of the mechanized forces. In many cases, industry lacked necessary expertise to initially meet the stated requirements. The requirements developed by Guderian and his motorization staff were detailed and technically advanced, particularly in the areas of radios and optics.[34] These requirements drove new technological development, rather than allowing technology to drive military needs. His thorough and detailed development of doctrine and tactics, as well as in organizational structure and equipment over a period of years helped ensure the detail and quality of the requirements. A combination of history, war games, exercises

and maneuver training along with the variety and depth of his war time experience all contributed to his ability to visualize the future and synthesize his knowledge and experience into an accurate view of what it would take to get there.

As Hitler embarked on his policy of national expansion, mechanized forces continued to train, expand, and receive newer and better equipment. By 1937, army level maneuvers were held with foreign observers invited. But old thinking still existed. British observers questioned whether massed armor could be employed in wartime the same way it was on exercises. Perhaps resistant to learn from or acknowledge the improvement of their enemy, like their French allies, they tended towards the opinion of tanks as an infantry support weapon.[35]

The occupation of Austria in 1938 gave now Lieutenant General Guderian the opportunity to exercise his concept as the commander of the XVI Army Corps. He led the unopposed occupation force with his 2nd Panzer division. Maintenance and supply problems plagued the mechanized forces, however. Critics seized on these problems to conclude that mechanized forces could not conduct sustained operations. British Prime Minister Winston Churchill, undoubtedly advised by some of the same military leaders who just the year before questioned the effectiveness of German armor forces, saw this as further reason to doubt the readiness and effectiveness of the German Army for combat operations.

Guderian, however, viewed the experience as another training opportunity. Though defensively noting in his own version of an after action review that the invasion

was conducted on short notice, while many units were still conducting company-level training and not prepared for division and corps movement, he also noted deficiencies in fuel resupply and maintenance operations, particularly tank maintenance. The experience gained was invaluable, and he noted that "this mistake was never made again."[36] Guderian's XVI Army Corps likewise led the march into the Sudetenland and had none of the problems experienced in Austria.

Though debated in international circles at the time the tactics and techniques of blitzkrieg pioneered by Guderian and developed painstakingly over much of his career were set. With a now infamous ferocity, the effectiveness of combined arms mechanized operations in cooperation with aircraft made their debut in Poland in 1939. Guderian, now with a new command, had also integrated tanks from the Czechoslovakian army which the Germans occupied earlier in 1939. These tanks, along with captured tanks from the Polish Army, were integrated into the mechanized force for its next operation - the invasion of France.

The psychological effect of warfare on soldiers came through in this campaign and demonstrated that unexpected actions can occur even when equipped with new and superior technology. Members of his own staff went into a panic when they received reports that Polish cavalry was headed their way and ceased work to prepare defensive positions. He calmed them and got them back to work. On the second day of the war one of his motorized infantry divisions reported it was withdrawing under threat of attack by Polish cavalry. Guderian again calmed the division commander and assured him he

could hold his positions. He personally visited the division the next day to determine if there were problems there.[37] Technology clearly had not changed the role of the commander or the need for leadership. Though it caused some concern among German forces early in the war, the truth of the Polish cavalry was a clear inability to understand the nature and effect of the new form of warfare they were facing. Horse-mounted charges with swords and lances against tanks suffered heavy losses.

Despite wide distribution of radios, Guderian still exercised face-to-face command and moved forward to personally see the battlefield on several occasions. In one instance, he found a panzer division attack across a river in disarray. Commanders could not be found, tanks were far to the rear, artillery sat idle and no reconnaissance was being conducted. Through personal involvement he corrected the situation and got the attack going again.[38]

Following their success in Poland, the German Army conducted intensive training in the winter of 1939-1940 to build on the lessons learned in Poland and help the entire army to assimilate the experience.[39]

France, 1940

The speed of the invasion of Poland and rapid victory were clearly attributed to Guderian's armored and mechanized forces. He regarded his decoration with the Knight's Cross of the Iron Cross as a vindication of over twenty years work in developing and bringing to fruition this new form of warfare.[40] Though the German Army was now convinced, Germany's enemies and other armies were still several steps behind in

grasping the new concept. Many still clung to older doctrine and older ways of thinking. In the U.S., France, and Britain military leaders attributed the defeat of Poland more to the weaknesses of the Polish military than to the strengths of the German military. France and her British allies, secure behind the defensive Maginot Line and the thick natural barrier of the Ardennes Forest prepared to fight a replay of the attack plan employed by the Germans in World War I.

Though the German army now accepted Guderian's armored force and its new doctrine, the General Staff did not entirely embrace the mental flexibility felt necessary for effective mechanized operations. Erwin Rommel, one of the young officers who grasped Guderian's concept of mechanized operations and was destined to become one of its most adept practitioners, observed that "Prejudice against innovation is a typical characteristic of an Officer Corps which has grown up in a well-tried and proven system."[41]

Ironically, the General Staff chose to attack France exactly as the British and French expected them to attack--a replay of their World War I attack based on the Schlieffen Plan. Another of Guderian's adherents, General Erich von Manstein, submitted a plan, which, though following the intent of Schlieffen's plan--an envelopment based on the ancient battle of Cannae--followed a riskier route through the Ardennes Forest. Manstein earned the ire of the General Staff for his insistent defense of his plan. When the General Staff rejected the plan, Manstein took the opportunity to circumvent the higher command by presenting his plan directly to Hitler, without realizing that Hitler

had already arrived at a similar concept of his own.[42] For his conflict with the General Staff and the Chief of Staff, and perhaps his vigorous defense of new and different tactics, Manstein was awarded command of an infantry corps in the third wave of the attack, rather than the command of a new panzer unit in the spearhead. Guderian credited Manstein's initiative and operational plan as the reason for the ultimate stunning success of the French campaign.[43]

For Guderian, the attack against France started with a review of lessons learned from the Polish campaign and the initiation of necessary changes in organization and training. With the adoption of the Manstein plan, a series of war games were conducted to refine the plan. Guderian sought to exploit the strengths of mechanized forces by focusing armor power at a decisive point in a surprise blow. Concern by other officers over the capabilities of the armor and mechanized forces, whether armor should hold its advance to wait for more infantry, or whether the armor should be split up dominated discussions. Guderian believed splitting up the offensive power of massed armor was the worst mistake that could be made, yet the plan began to turn in this direction. He became further frustrated when he realized that the campaign commander, Colonel-General von Rundstedt, lacked "any clear idea about the potentialities of tanks, and declared himself in favor of the more cautious solution."[44]

As a student of history and human psychology, Guderian recognized other factors that he felt favored a doctrine of offensive maneuver and striking decisive blows at critical points in the enemy's defense. A student of both French and British doctrine, he

recognized the defensive nature of the allied plans and their strategic and tactical doctrine of positional warfare. The French in particular relied on fixed, static defensive fortifications of which the Germans had reliable intelligence. This intelligence included knowledge of weaknesses in the defense opposite the Ardennes Forest in the vicinity of Sedan. Guderian deduced from the allied order of battle and the deployment of their forces that they expected the Germans to attack exactly as they had in the nearly successful Schlieffen plan. The allied inactivity in the west in 1939 while the bulk of the German armed forces were east in Poland failed to recognize an opportunity to strike against a German weakness. It also said something about the state of mind and intent of the allied military and civilian high command. Though Guderian expected the French soldier to fight bravely, it was clear their leadership and the bulk of their military expenditures in the interwar years focused on the purely technical solution of the defensive Maginot Line rather than modernization and upgrade of the armed forces and their tactics.

From his education Guderian was able to assimilate the entire strategic and operational situation better than all but a few senior commanders, most of whom shared his views. Viewed from a position of information dominance that depended as much on understanding the available data as collecting it he visualized an operation in which the risk of maneuver through the Ardennes (which would be partially offset by armor forces moving faster than marching infantrymen) was compensated for by the benefit of surprise. His decision-making process revised and updated outdated assumptions on the speed of movement through the forest based on modern mechanized forces and

assimilated available information while allied decision making remained reliant on World War I movement rates and assumptions.

He described his conceptualization of the operation by concluding that "a determined and forcibly led attack by strong armored forces through Sedan and Amiens, with the Atlantic coast as its objective, would hit the enemy deep in the flank of his forces advancing through Belgium; I did not think that he (the allies) disposed of sufficient reserves to parry this thrust; and I therefore believed it had a great chance of succeeding and, if the initial success were fully exploited, might lead to the cutting off of all the main enemy forces moving up into Belgium."[45]

The decisive point was maneuver through the restrictive, and to some seemingly unpenetrable, terrain of the Ardennes Forest. Manstein too recognized the weakness in the allies erroneous assumption that German maneuver through this terrain would be sufficiently slowed to allow deployment of reserves, shifting of forces, and preparation of a defensive line along the Meuse River.[46] Manstein and Guderian, more experience in maneuvering armor than their allied counterparts, recognized that the terrain was passable. Their visualization of the battlefield saw that French armor, dispersed to support the infantry and lacking the same distribution of radios as the panzer divisions, would be much slower in responding to the attack. Allied equipment, as well as their command and control, would not be sufficiently flexible or agile to prepare defenses and effectively respond. Guderian recognized that surprise was achievable. The clear lack of flexibility and mental initiative in the French High Command added to the effect of surprise.

Through their tactical deployments and disposition of forces, he observed a limit to their battlefield visualization that "did not regard any alternative to the old Schlieffen Plan as even conceivable."[47]

History here demonstrated the utility of war gaming and its ability to assist in visualizing a battlefield and contribute to the initiative and agility of forces executing an operation. The German armored spearhead reached the Meuse River on the evening of D + 2, or 12 May 1940, exactly as predicted in a *kriegspiel* held in Koblenz in February to test the feasibility of the Manstein plan. The operations officer of the lead Panzer division "noted the remarkable similarity of the actual course of operations to the war game . . . . From his files he pulled out the order he had issued in the *kriegspiel* operation . . . . Changing only the date, he issued the same order to the division."[48] The 1st Panzer Division went on to decisively seize the key objective on Sedan the next morning, while to their north, the 7th Panzer Division, commanded by Erwin Rommel, did the same near the town of Dinant.

As superior tactics and mental skills in applying technology to the battlefield contributed to German victory, French defeat stemmed in part from over confidence in their armor technology. French armor at this time had many advantages over German armor. French guns were a larger caliber and their armor much thicker than German tanks. They also had more tanks than the Germans.[49] Panzer commanders recognized that they needed their speed and mobility to avoid the perceived stronger French foes. It was the French tactic of dispersing their tanks and not equipping them with adequate radios for

command and control--and German knowledge and familiarity with their enemy's tactics--that prevented the force with the better technology and equipment from turning technology into an advantage on the battlefield. The equipping of German tanks with two-way radios--clearly influenced by Guderian's experience with radio as a young officer and the support he received from the chief of the German Signal Corps in developing blitzkrieg--contributed immensely to the flexibility of German armor forces. Martin Van Creveld observes that "this flexibility, possibly even more than the tanks themselves, constituted the core of the new style of warfare."[50]

Guderian was ultimately able to convince most (but not all) commanders of the merits of his plan. He credited the final success of the invasion of France to both Manstein's initial concept and the fact that the division commanders of the spearhead through Luxembourg were all men he had trained and worked with. These officers shared his belief that "once armor formations are out on the loose they must be given the green light to the very end of the road."[51]

Through years of study and preparation, Guderian demonstrated the leadership and conceptual knowledge necessary to synthesize his light infantry and other experience from the First World War and interwar experience into tactics applicable to new technology. His broad-based and diverse experience ultimately resulted in his assimilation of history and other learned and acquired knowledge into a new form of warfare. He was aided in this effort by students and colleagues who further communicated these concepts to their subordinates. His longstanding conflicts with old ways of thinking and the inertia

of bureaucracy exemplify the challenges in presenting new ideas and concepts. Knowledge and logic could not persuade many of his detractors. It ultimately took battlefield success to convert his staunchest critics.

United States

In the U.S. and other allied nations armed forces now were in the unenviable position of playing catch up with the results of over twenty years of intellectual and practical development that Guderian had put into blitzkrieg.

The United States faced a different set of challenges and a different strategic environment in adapting to the evolving form of warfare. With oceans to separate them from potential enemies and a strong political bend towards isolationism, far more of the limited resources available for national defense went to air and naval forces than to the ground component. Less resources and emphasis restricted the ability to evolve new thinking and new concepts.

As in other countries, a few key individuals were able to visualize how world events would or could evolve and develop a concept as well as exercise the leadership necessary to prepare for the coming conflict. A key individual in this effort in the United States was George C. Marshall. Like Guderian, Marshall too had combat experience from World War I, in his case as a division G-3. Observing a systemic problem with the transmission of orders that resulted in lower commanders receiving very little time to assimilate and brief their command, he resolved to do something about it. Using the relatively new technology of the field telephone, he instructed orders be sent via field

phone, though this violated existing security instructions. Expecting to be reprimanded, but accepting responsibility, Marshall was instead lauded by the Corps Chief of Staff for saving units of I Corps up to two hours in the dissemination of orders. "Marshall's initiative in this instance was used after World War I at Command and Staff, Fort Leavenworth, as a classic example of staff leadership."[52]

Marshall's outstanding performance as a G-3 earned him promotions from Captain to Colonel in one year, but also kept him from what he wanted--a combat command. In addition to combat experience, Marshall also shared with Patton, Guderian and other visionary and adaptable leaders of the transition to mechanized warfare a love of reading and history. As a cadet at the Virginia Military Institute (VMI), he exercised and developed the ability to see and visualize a battlefield by visiting many Civil War battlefields and studying the terrain. During pre-World War I maneuvers in the Philippines, he expanded these mental skills by visiting not only sites of U.S. battles against the Spanish, but by studying the guerrilla campaigns of the Filipinos against the U.S.[53]

In later service in China he added to his reputation as a leader and a trainer. To stave off the boredom of overseas assignment, he encouraged officers to learn the Chinese language and instituted unique and interesting training and cross-training, including teaching infantry officers to ride horses and gain appreciation for cavalry. His program was not all work and not all strictly military. It included construction of a skating rink, hunting, and a competition between units in staging amateur theater productions.[54]

He followed his assignment in China as an instructor at the Army War College in Washington, D., and then the Assistant Commandant at Fort Benning. Here he again demonstrated the initiative to break the rules from time to time to ensure the welfare of his soldiers. In an imaginative solution to a shortage of classrooms and lack of funds to build new ones, he authorized his NCOs to demolish several old World War I buildings and use the salvaged lumber and building materials to construct the needed facilities.

As in China, he recognized the need for diversity in training, and the need to find unique and innovative ways to support his training goals. In social gatherings for his instructors, held at his quarters, he made it a point to play "mentally stimulating" games. As one of his instructors recalled, "He was always exercising young people's minds as well as their bodies."[55] In a later assignment he was in charge of training for the 33rd Division of the Illinois National Guard. As at Benning, he maintained close contact with his instructors and provided both leadership and mentorship to his trainers. He frequently observed training and provided feedback and critiques to his instructors. One senior guard officer stated that in thirty-seven years with the Illinois National Guard, he had never seen "as much progress in our training" as the period of Marshall's assignment. His patient and even-tempered demeanor and "his professional knowledge of everything pertaining to soldiering won for him the confidence and respect of all officers and men."[56]

In 1939 Marshall ascended to the position of Chief of Staff. With a lifetime of leadership and training experience he now faced the challenge of training and modernizing the army to fight the new form of warfare developed and now being executed by the

Germans. In 1936, when Guderian was already well into mechanization of his forces, Marshall was consoling one of his young officers frustrated at the lack of promotion opportunities that the U.S. would be modernizing "soon."

The U.S. attempts at transitioning to new technology ran into similar problems as other armies. Both the cavalry and infantry branches debated differing roles for the armor and mechanized forces, with neither yet espousing as clear a vision as the developing German concept. Cavalry forces saw armor as a way to allow horse cavalry to return to its role as a maneuver arm - a role that machine guns denied it in World War I. The Infantry branch, as in other nations, saw the role of the tank as an infantry support weapon. As a result, early American tank development had two competing branches developing different equipment requirements.

Though key leaders, such as Patton and Eisenhower, watched the development of other armor forces, particularly the British, the initial development of U.S. forces was not as a combined arms force on the German model, but rather an armor pure force during development in 1937-38.[57] Though the Germans did not classify their work, U.S. development did not make as much use of foreign experience and lessons learned as did Guderian and the German mechanization developers. The delay in development of the U.S. armor force did, however, allow the American effort to benefit from mistakes made in other forces and not have to remake their mistakes. Another advantage in American forces not available to other armies was the widespread experience of new soldiers with

motorization through the efforts of Henry Ford and the widespread availability of the automobile to average American families.

Developments in 1939 and 1940 began to borrow from other armies. A single prototype Cavalry Brigade (Mechanized) under the command of emerging armor leader Adna Chaffe began to evolve as a combined arms mechanized force.[58] Three of four Army commanders competed to have Chaffe's brigade for the spring maneuvers to be held in Louisiana in early 1940. The honor went to the Third Army. This army also received the provisional armor brigade formed by the Infantry school. The stage was set for the famous Louisiana Maneuvers, the first of several field exercises that would serve as a combat laboratory and evolve the American solution to the integration of the internal combustion engine and the development of the tactics to address a new form of warfare.

Prior to May, 1940 American military thought on mechanization remained sharply divided. Opposition to a separate arm of the service for armor and mechanized forces and support for the status quo was driven by parochial branch concerns, lack of knowledge about armor forces, a failure to grasp the impact of armor and blitzkrieg tactics or simply better familiarity with the known, but outdated, tactics of World War I. Many officers arguing in favor of the status quo attributed German success not to new equipment and tactics, but to the weakness of the Polish Army. They maintained that this success could not be duplicated against a "first rate opponent."[59]

Louisiana and Carolina Maneuvers

As an effort to train and help reengineer new doctrine and tactics to potentially face the German threat, this first Louisiana maneuver was not only the first Corps-level maneuver conducted since World War I, it was also the first multi-corps exercise ever conducted by the U.S. Army.[60] Though generally unremarkable as a training exercise, as a warfighting experiment the May, 1940 maneuvers saw the formation of the first provision mechanized division formed from the Cavalry Branch's 7th Cavalry Brigade (Mechanized) and the Infantry Branch's Provisional Tank Brigade under the command of Third Army.[61] The German invasion of France struck during the maneuvers, however, and in a highly effective demonstration of blitzkrieg's effectiveness against a first rate army, was over by the last day of the exercise.

Marshall needed no more convincing of the general direction for the U.S. Army to take and dispatched one of his assistants to Louisiana to confer with key armor leaders. In a meeting that included Patton and Chaffee, as well as other key commanders and interested officers, a recommendation was developed to form a new branch. Notably, the chiefs of Infantry and Cavalry branch were not invited to the meeting, though they attended the maneuvers. Amongst the armor leaders, it was generally felt the two branches had wasted far too much time in the development of armor and mechanized forces.[62] The Chief of Staff approved the creation of the new branch, and the Armor Force was created in July, 1940 with Brigadier General Chaffee as chief.[63]

The challenges facing George Marshall included not only focusing and fine tuning the integration of new technology and tactics into Army operations, but the challenge of incorporating National Guard, Reserve forces and draftees into the evolving force as well. These forces would need additional training in not only basic soldier skills, but in new weapons and equipment as well. Though the invasion of Poland in 1939 started to shake America out of isolationism, the rapid overrunning of France served as a more urgent wake-up call. As Chief of Staff, Marshall was also dual hatted as the Commander, Field Forces, the U.S. command then responsible for training. To more efficiently cover the tasks at hand, Marshall called on Brigadier General Leslie J. NcNair, commandant of the Command and General Staff School at Fort Leavenworth, to serve as the Chief of Staff of the General Headquarters (GHQ) and take on the bulk of responsibility for training American forces.[64]

McNair moved almost immediately to change the flow and structure of army training and at the same time cut through existing bureaucracies to strengthen his belief in combined arms training. He developed a simple, yet revolutionary at the time, progression of training from individual skills, small unit training, combined arms training, and finally large scale maneuvers.[65] Prior to this, each branch conducted training for its proponent soldiers, with little or no coordination between branches. McNair's combined arms training changed this, and provided, for example, for infantryman to gain familiarity with artillery and vice versa. "These steps," he wrote to General Marshall, "are the foundation of military efficiency. They can be hurried and slighted only at a price.[66]

Clearly, McNair recognized, as did Patton, the trade off between quality and quantity in military forces and its application to training. McNair's new systems would soon be put to the test as it prepared to receive eighteen National Guard Divisions and an influx of new soldiers under the Selective Service Act call-up authorized by the President.

Though Patton's prediction of the coming war differentiated between armies of quantity vs. armies of quality, McNair was now faced with the challenge of producing an army of both quantity and quality. In orders on preparing to receive these new soldiers into the training system, McNair emphasized that "the present national effort and the conditions which have caused it demand intensive training and the attainment of the highest standards. There will be no compromise as to quality."[67]

McNair also placed great emphasis on training realism, an area that would receive further attention during the next round of GHQ maneuvers in the fall of 1940. Though the initial maneuvers were roundly criticized for their use of "simulated" weapons, such as rifles used to represent machine guns and tanks replicated by trucks with "tank" painted on their sides, he accepted the need to use simulated weapons and tanks during training, realizing that simulated weapons were better than no weapons at all. This attitude also attested to the value he placed in the overall training event despite some unavoidable imperfection in the details.

In August 1940, the army underwent another round of maneuvers, with each army conducting training for National Guard divisions as well as conducting corps on corps maneuvers. Each corps included a total force of active army, National Guard and Army

Reserve forces. The maneuvers showed that active and guard forces were clearly at different levels of training, with deficiencies in all forces. The two week period of training for the National Guard forces before the exercise was evaluated as "wholly inadequate," emphasizing that forces participating in large scale maneuvers must be "highly trained and perfected in all that is required of the lower echelons . . . ."[68]

Another criticism of the maneuvers was their fixed, rigidly controlled sequence of events. In his comments as Commanding General of the Third Army, Major General Walter Krueger criticized rigid and predictable training for its stifling effect on the development of key mental skills by commanders, especially that of initiative. "Maneuvers that are rigidly controlled by previously arranged schedules eliminate initiative and individuality of commanders," he explained, describing initiative as a key quality for a commander, one which all commanders must have the opportunity to exercise.[69]

Krueger and Third Army distinguished themselves with a training innovation not seen in any other army at the time, which contributed, to education and training of units following not only this maneuver, but all other GHQ maneuvers while Krueger was in command. Though called critiques, Krueger conducted a review at the end of each exercise more reminiscent of a present day CTC after action review (AAR). The critiques developed a reputation for extremely high quality and attention to detail. He opened with a review of what happened in each day's maneuver, conducted against a background of color terrain slides. His presentation included stinging criticism of things which could

have resulted in casualties in combat. To reinforce his lessons, he illustrated key points with photographs and graphics. Subordinate commanders had an opportunity to comment and add their observations. The result, according to one observer, was more than a critique but rather a comprehensive military discourse, which he described as "instructional events."[70]

Krueger's background included, as did Marshall's, Patton's and Guderian's, a reputation for being both "scholarly and widely read."[71] He served for several years as an enlisted soldier before receiving a commission prior to World War I. Born in Germany and brought to the United States at a young age, part of his experience and knowledge of German doctrine can be attributed to his translation of many of these works while a young officer at Fort Leavenworth. Patton's library included some of the works translated by the young Krueger. Like Guderian and Patton, Krueger had both combat experience at the division level during World War I and stayed abreast of the development of tactics and doctrine in various armies around the world during the interwar years. He gained further experience in mechanization in 1939 as commander of the Army's prototype triangular division, where in tribute to his leadership and excellence as a trainer, his soldiers referred to themselves as "Blitzkruegers."[72]

Krueger demonstrated a steadfastness of purpose and mental flexibility by his willingness to allow his command to deviate from doctrine from time to time, so long as the end result remained operations executed with "speed, forcefulness and determination."[73] By focusing more on soldiering and less on politics, Krueger was able to

maintain much better relations with and was held in much higher esteem by National Guard soldiers than almost any other senior regular army officer.[74]

Through subsequent maneuvers, Krueger's training leadership permeated his command. Another innovation and training initiative emerged from the G-2 Staff. The Army G-2, recognizing the importance of intelligence to the staff as a whole, not simply limited to the G-2 section, took on the task of conducting a comprehensive combat intelligence school for personnel from the Army down to the brigade and regimental level.[75] This training helped the entire intelligence system, and in effect created a more cohesive network of intelligence throughout the Third Army.

Third Army retained a reputation for training excellence throughout the remaining maneuvers and for the rest of its time in CONUS. Though commanders and key leaders rotated to other units and positions, staff officers and others who remained received credit for helping the Army retain its stellar reputation. This same reputation would later translate to proven combat performance under the command of General Patton.

The next cycle of maneuvers in the fall of 1941 built on lessons learned in the earlier maneuvers. McNair's GHQ, the training units and key leaders continued to refine the role of these large scale simulated combat exercises as an engine of change for doctrine and organizations adapting and evolving to blitzkrieg as well as a vehicle for both training and leadership development.

McNair, moving to correct previous deficiencies and act on his belief that realism was essential to effective training, implemented new rules and guidance to change the

exercise from a pre-scripted, predictable exercise to a free play maneuver that would require greater thought and initiative by commanders and staffs alike. Third Army would continue to enhance its reputation as well as contribute to the experience of its new Chief of Staff, Colonel Dwight D. Eisenhower.

Though demonstrating leadership and instincts for improving training, McNair also demonstrated that the commander's personal prejudices and pet peeves can influence the outcome of exercises and evaluations in a manner disproportionate to other theories and opinions. McNair was a strong proponent of anti-tank weapons. Critics argued that the rules for the maneuvers unfairly favored these weapons, to the detriment of tanks.[76] Rules of engagement for the maneuver--the controlling measure for the exercise simulation--included allowing tanks to be unrealistically disabled by machine guns and hand grenades.[77]

As a result of the maneuvers, anti-tank weapons received highly favorable comments, which led to authorizations to devote resources to the creation of new anti-tank battalions and integration of anti-tank warfare into American doctrine. Despite the anti-tank bias in the maneuvers, however, a synergy developed as both the armor and anti-tank forces circulated a series of training memorandum passing on lessons learned from the maneuvers.[78] They disseminated tactics, techniques, and lessons learned to a wider audience than actually participated leveraging both the training and more importantly the lessons themselves.

Combat experience ultimately resolved the anti-tank debate. Rather than the concept of massed AT battalions held in reserve by divisions and corps espoused by McNair, combat commanders opted to employ dispersed AT platoons and companies forward with infantry units. The numbers of battalions envisioned by McNair were never required, and as the war progressed, many battalions were disbanded to fill infantry shortages.[79]

Though demonstrating that success in maneuvers do not always translate to success on the battlefield, McNair strived to ensure the maneuvers and CONUS training stayed current with developments in the field. Through use of his own version of Napoleon's "directed telescope" in a training context, McNair expanded the database he and his staff could draw on for the latest and most up-to-date developments. A rotating team of observers went forward into the combat theaters and provided valuable first-hand information used to adjust both training and developing concepts.[80]

The first set of maneuvers, held in Louisiana, pitted Krueger and the Third Army against Lieutenant General Ben Lear and the Second Army. Second Army included the 2nd Armored Division, commanded by Brigadier General George Patton. Lear and Krueger differed significantly in both their leadership style and temperament. Lear lacked Krueger's rapport with the common soldier, was a more by-the-book leader, less willing to accept the doctrinal deviations Krueger was willing to tolerate, and was know more for abrasive criticism than Krueger's educational critiques. He also lacked Krueger's familiarity with new and emerging doctrine, particularly for armored and mechanized

forces. Rather than grasping the potential for speed and mobility presented by the new technology, he took a more conservative view, stating, "It seems to me that many of you have the impression that an armored force can go busting into battle at a very high rate of speed. Quite the contrary. An armored force the size of a division requires a great deal of time for its deployment into battle."[81]

McNair's Director of Training for the maneuvers, Lieutenant Colonel Mark Clark, gave each Army an offensive mission, setting the stage for a large meeting battle. Third Army, with its more comprehensive pre-maneuver training, demonstrated a better ability to assimilate and react to battlefield information. The Chief of Staff and his Army Staff produced clear and simple orders and disseminated them to subordinate commanders in sufficient time to allow further planning, coordination and dissemination. Third Army commanders were better prepared to seize the initiative. This was demonstrated by 1st Cavalry Division in seizing a key ford site and using an improvised ferry to cross into the rear of Second Army forces in the west and by 37th Division in exploiting a gap to do the same in the east.[82] These key actions created a double envelopment and placed Third Army at a significant advantage over Second Army.

Second Army's maneuver was more plodding and cautious. Despite fairly accurate intelligence, including prisoner interrogations, captured maps and orders, as well as sittings of enemy forces by aerial observers and ground forces, Lear and his staff failed to adjust their plan.[83] As the exercise progressed, with Third Army troops occupying key terrain on both flanks of Lear's forces and exploiting weaknesses in Second Army's

lines, the response of Lear and his staff was to continue planning for a subsequent attack. Through repeated tinkering and changes to the attack plan, Second Army not only weakened the plan, but also degraded subordinate ability to execute it through changes to the plan and delays to its dissemination. Perhaps lacking the ability to see and sense the battlefield that Krueger and his subordinates appeared to grasp, Second Army changed their attack plan from a focused armor thrust to one that dissipated combat power across the front.[84] Though some gains were made, no decisive results were achieved and the effect was to impale his maneuverable armor against Third Army's defending infantry. Through a combination of rules of engagement, poor execution and ineffective use of armor forces by Second Army and skillful emplacement of anti-tank forces forward by Third Army, the anti-tank units received credit for many tank kills. On recognizing the battlefield situation and seeing the predicament of Lear's armor, Krueger and his staff moved decisively to commit their reserves to the attack.[85] With the outcome of the battle certain, McNair concluded this phase of the exercise and moved to the critique.

Though McNair's strong desire to see the anti-tank forces succeed contributed to their success, Krueger's training of his anti-tank groups, as well as their employment and execution by subordinate units also deserves credit. In the pre-exercise Army maneuvers, Third Army provided directed and focused training for their anti-tank forces that worked specifically on their skills in conducting reconnaissance, internal and external communications, rapid maneuver and selection of effective fighting positions.[86]

Ironically, reconnaissance, liaison and maneuver skills in infantry and armor units were seen as weak throughout the Louisiana Maneuvers.

Though praising several units, including the 1st Cavalry Division for their well-executed river crossing, McNair's comments were hard-hitting and direct. Units were not trained in dealing with an air threat, and failed to take defensive measures, including proper emplacement of air defense assets. Air power, as much as armor and mechanized forces, represented new technology to be adapted to, a process that didn't come naturally. The failure of units to use maneuver in the attack was also singled out as a deficiency. Consciously or unconsciously, the slower and more familiar positional warfare learned by many leaders and staff officers in World War I and post-war training was not easily shaken for the faster paced

Several key issues involved command and control and the flow of information available to commanders and staffs in the planning and execution of their operations. Poor reconnaissance, which provides the essential information for seeing the battlefield, and security, with its essential force protection and defense against surprise, were described by McNair as "one of the most serious faults observed during the maneuver."[87] Operations orders were "frequently too complex or unintelligible and reached addresses too late for action."[88] McNair also observed that commanders were unable to effectively synchronize all their assets, nor could they focus combat power. In comments that echoed Guderian's observations from the invasion of Poland, McNair noted that for a variety of reasons, artillery assets in particular often did not get into the fight. He zeroed

in on "inadequate staff work" as the cause of traffic jams and occasional problems with supply distribution in the rear areas.[89]

Though McNair predictably credited the success of anti-tank forces to anti-tank doctrine and a validation of the concept, others saw instead Second Army's "failure to appreciate the capabilities and proper role of its armored forces"[90] as contributing to the defeat of armor by anti-tank forces. Other observers noted weaknesses in armor doctrine and within the armor divisions themselves that contributed to the poor showing of armor, though these did not receive as much attention from McNair. Though echoing lessons already learned by Guderian and the German Army in the 1930s on the need for combined arms operations, armor, infantry and artillery units within the armor divisions tended not to work as teams. Liaison and coordination between units was poor, and even broke down between and within individual armor units, and "actions tended to be fought by individual tanks."[91]

For this phase of the maneuvers, Second Army received a defensive mission, and detached the I Armored Corps to Third Army, whose mission was to attack. Krueger, Eisenhower and the Third Army staff developed a simple, flexible plan that called for fixing forces with lead infantry divisions, and then maneuvering with his armor reserve, including Patton's 2nd Armored Division. Lear relied more on his own detailed planning than on working with his staff. He made a decision to withdraw from initial defensive positions on the first night of the maneuver, regardless of actions by Third Army,

without consulting his G-2. As in earlier maneuvers, Lear preferred to fight the plan as developed, rather than adjusting it to a changing situation.[92]

The first few days of the maneuver were dull and uneventful as Second Army continued to withdraw and avoid contact with Third Army. Though not degrading the combat power of the attacker, he was accomplishing his mission of defending Shreveport, Louisiana. Numerous bridges were "demolished" by Lear's forces, whose cavalry then disrupted "repair" attempts by Third Army engineers, delaying the Army's advance. Poor weather also contributed to the delay. To break the stalemate, Third Army's staff, guided by Eisenhower, developed a new plan calling for an armor envelopment along the western flank. New orders were developed quickly and efficiently, and disseminated to subordinate commanders for final coordination.[93]

Though Second Army received timely and accurate intelligence regarding the envelopment, Lear and his staff made no immediate changes or adjustments to their plan in response to it. With Krueger's 1st Cavalry Division fixing Lear's 1st Armored Division, Patton and 2nd Armored Division moved to seize the Army objective of Shreveport. Though the original plan called for attacking the city from the west, Patton's picture of the battlefield showed this would be a frontal attack against a force in prepared positions. He instead issued orders to continue past the defenders and attack the city from the north.[94] Though Second Army was still capable of defending, with Patton deep in the rear conducting attacks to seize Third Army's objective, McNair concluded the maneuvers.[95]

Patton's successful battlefield agility was enhanced by Second Armored Division's participation in Third Army maneuvers prior to the GHQ maneuvers in which the division conducted a similar sweeping envelopment.[96] Like Krueger, Patton was personally involved as a trainer and used the exercise as an opportunity to train not only his staff but his entire command. At the conclusion of the Army maneuver he assembled the entire division and using four huge maps personally explained to the division what it had done well and what needed to be improved.[97] The division's 300-mile sweep to Shreveport helped Patton and Third Army learn more lessons, however. As Guderian learned in 1938 moving into Austria, armor forces pose significant logistics challenges that are highlighted on long operations. Patton's forces ran out of fuel before reaching their objective, a problem he solved by personally purchasing fuel and conducting refueling operations at roadside service stations.[98]

In his critique of the second phase of maneuvers, McNair observed that though fewer deficiencies were noted, "most deficiencies were repeated," though adding that this was expected, "for faults are not remedied overnight."[99] He understood that training was a process, and if done with the quality needed for new weapons, systems and technology, a lengthy and time-consuming one. "Training a division is not an easy task," he said, "It takes a solid year of hard work."[100]

Back in Washington, DC, George Marshall was taking flak from congressional critics who questioned the expense of the exercises, and questioned their effectiveness given the deficiencies identified. Marshall gave an impassioned defense of the maneuvers

and the value of the training during Senate testimony in which mistakes made in the maneuvers were criticized. "My God, Senator," said Marshall, "that's the reason I do it. I want the mistake [made] in Louisiana, not over in Europe, and the only way to do this thing is to try it out, and if it doesn't work, find out what we need to make it work."[101]

The maneuvers continued with another cycle of exercises in North Carolina, destined to be the last maneuver conducted with the U.S. at peace. Some attempts at corrective action were made in the period between the Louisiana and Carolina maneuvers. Major General Charles L. Scott, commander of I Armor Corps, emphasized the need for combined arms operations, reconnaissance to develop the situation, and attacks against enemy weakness, rather than the fruitless assaults against prepared defenses seen too often in Louisiana. As opposed to McNair's belief that anti-tank forces provided the antidote to blitzkrieg, Scott told his subordinate commanders that the armor mission was "to advance rapidly to critical locations in the rear of the hostile lines... In this advance, the attack and destruction of forward elements are merely incidental."[102] His offensive mission for armor met McNair's stated, but unrealized, intent for offensive maneuver by anti-tank forces. Many observers began to realize that the anti-tank gun had defensive potential, but could rarely be used offensively as McNair envisioned.

This cycle of maneuvers were designed specifically to test a smaller, armor heavy force against a larger foe. The maneuvers pitted Lieutenant General Hugh A. Drum and his First Army against IV Corps and I Armored Corps, commanded by Major General Oscar W. Griswold. Though outnumbered almost two to one, Girswold's advantage

would be in his more maneuverable armor forces. Command and control as well as the training of commanders and staffs would also play a role, however.

Drum, a senior and seasoned commander, was steeped in a belief in the slow and deliberate tactics of World War I and skeptical of the bolder maneuver of blitzkrieg. As the First Army Chief of Staff, in 1918, he achieved his greatest triumph as the planner of the American offensive at St. Mihiel.[103] Like German planners of World War I who fell back on the success of earlier operations rather than risking something new or different, Drum was both a student and a victim of World War I success. He also had the advantage of time in command and opportunity to train his staff over Griswold, having taken command in 1939, as opposed to Griswold, who took command of IV Corps only a few months earlier.[104]

Griswold, however, believed in the power of mobility and was a proponent of the new bolder tactics and thinking that were growing in response to blitzkrieg. He commanded the 4th Motorized Division before assuming Corps command, and had experience in the maneuver of mobile forces. He recognized his weakness, however, admitting, "My experience had been limited in the field of high command and I really feel like a gawky high school boy who suddenly finds himself on a college campus."[105]

As in the first phase of the Louisiana maneuvers, each force was given an offensive mission to set the stage for a large meeting battle. Drum and his staffed developed a detailed and methodical plan to advance and attempt to turn IV Corps northern flank. In the words of one historian, Drum's plan "constituted a throwback to

the art of war as practiced in 1918."[106] Griswold's concept was to move rapidly with the mobility of I Corps to seize key terrain along a north/south river to contain and disrupt First Army's advance, followed by his infantry corps to occupy key road networks west of the river and then advance infantry forward to relieve the armor Corps and free it to attack in any direction.[107]

Despite coordinated air strikes against bridges and crossing sites by IV Corp, First Army was successful in crossing the river and establishing a bridgehead on the western side. Aggressive reconnaissance by Patton's 2nd Armored Division operating on the eastern side of the river did, however, succeed in temporarily capturing Lieutenant General Drum.[108] First Army's crossings in the north were more successful than those in the south. Highlighting the shortcomings of a fight planned in detail with little flexibility to address the actual situation, II Corps, commanded by Major General Lloyd R. Fredendall, was not aware that its southern crossing sites were unopposed, and went ahead with artillery preparations anyway, wasting both time and ammunition.[109]

The battle see-sawed for several days. The armor forces succeeded in containing the First Army bridgeheads, but also became engaged themselves and unable to concentrate elsewhere. After a sixty-mile rush to the front, they were piecemealed and fragmented. First Army achieved success in the north, and Drum sent a division to reinforce this success, but ordered the corps commander not to commit this division without permission from Army. Though decisive commitment of the reserve division in the north might have penetrated IV Corps single defending division, the delay allowed the

motorized infantry division to delay back to a subsequent river line. As a result of this single division holding off the First Army main effort, Griswold was able to concentrate forces in the center and south and counterattack, retaking lost ground and in one area, pushing First Army back to the river. Second Armored Division, however, lost numerous tanks in tank-pure attacks on prepared anti-tank positions, as had armor forces in the Louisiana maneuvers, in attempts to seize the key town of Cheraw until Patton organized a coordinated attack with artillery and succeeded in taking the town.[110] Under cover of darkness 1st and 2nd Armored Divisions turned their positions over to infantry divisions and withdrew to prepare for a counterattack to push back the First Army salient in the north.

The attack did not go as planned. Two of three columns intended to flank the First Army positions in the north instead attacked frontally. The third column succeeded in finding the flank and driving into the rear of First Army but lacked infantry and support forces to keep lines of communications open. First Armored Division lost communications with dispersed forces and could not coordinate the actions of its regiments.[111] Individual regiments continued with their mission, but not as part of a coordinated effort. Fourth Corps launched an attack against the First Army center in an attempt to delay their attack and rescue the scattered elements of 1st Armored Division, with little effect. Despite the armor regiment in their rear, First Army continued the attack and slowly gained ground. Recognizing a weakness in the south, Griswold

withdrew 2nd Armored Division to an assembly area to provide a force to send south if the need arose.

The IV Corps staff succumbed to their newness, as well as that of their commander and become overwhelmed with the operation. Their ability to support decision-making and control the battle diminished. Orders were issued late and subordinate units did not have time to conduct reconnaissance, staff coordination, or troop leading.[112] First Army made continued gains in the north and Griswold finally called off his attacks to withdraw to a defensive line further west. His staff worked to prepare an attack plan to relieve pressure on the new defensive line. The attack plan called for a replay of the earlier unsuccessful attack to the northwest and was not finished until midnight.[113] These attacks too were ineffective, and McNair concluded this phase of the maneuver.

Drum's application of old but effective tactics combined with a better trained and more experienced staff led to a clear victory, showing that technology alone is not the key to victory. Though Patton's thesis was that smaller, better equipped forces, could defeat larger forces, this battle showed (as do other historic battles) that technology alone is no guarantee of success. Clearly, the quality of the force is a key factor, with quality defined as the human factor, and not the technology alone.

Drum's force, however, also engaged in "gamesmanship" that can skew or undermine the results of any simulation or training exercise. Forces were pushed forward of their lines of departure and concealed from exercise umpires, giving the slower force

and edge over their mechanized foe. In a more glaring example, First Army used ration trucks, "immune from capture under GHQ rules" for deep reconnaissance missions against Griswold's forces.[114] Though the information and picture of the battlefield gained from these missions emphasized the value of intelligence and a good flow of information, the method was clearly not realistic.

The shortcomings did not go unnoticed. Due to the comprehensive structure of observers and umpires, McNair was aware of they key issues, both positive and negative. Despite Drum's victory, McNair was less than thrilled with First Army's performance. He chastised Drum in a confidential memo for the violation of exercise rules.[115] Publicly, he critiqued First Army for its slow and restrictive reinforcement of the Army's initial success in the north. He questioned staff work that micromanaged subordinate commanders further stifled initiative, stating "Initial field orders. . . were too long, contained contingent matter more suitable to a [subordinate] commander's planning, and were reminiscent of the technique used in World War I."[116]

Though IV Corps "lost" the battle, McNair was actually easier on them. Though a superior force had blunted all attempts at a corps offensive, Griswold maintained a defensive line in good order and conducted local counterattacks as he was pushed back. McNair suggested that motorized infantry and reconnaissance could have been used to contain the bridgehead initially to preserve the armor for later attacks, rather than becoming fixed as they were. He also noted attacks tended to be piecemealed, though it's not clear if this was due to planning at the Army or Division level or execution at the

regiments. The need for more infantry in an armor division and for better coordination and combined arms integration in these mobile organizations was clear.[117]

Once again, McNair lauded the performance of the anti-tank forces, though observers again credited their success more to poorly coordinated attacks by armor that failed to employ combined arms than to positive actions by the AT groups.[118]

Phase II of the Carolina maneuver, as in the Louisiana maneuver, put the smaller force on the defensive against the larger attacker. First Army moved out cautiously in a massive crescent shaped formation to envelop any defenders it encountered, holding two divisions and a strong anti-tank force in reserve to destroy any defending force caught in the envelopment. Griswold, correcting earlier deficiencies, organized his mechanized forces into combined arms columns of armor, infantry and tanks to delay and counterattack against the attacker. A column from Patton's 2nd Armored Division found a gap in First Army which it exploited. Though the small force was destroyed in the rear, they caused some disruption. The gap was between First Army's II Corps and VI Corps. Though Fredendall was aware of the gap, apparently no action was taken to close it.[119]

First Armored Division attacked the far west flank of First Army and succeeded in turning VI Corps flank. In coordination with the 4th Motorized division, they forced their opposition corps to a halt. Once again, Drum allocated reserves to the corps, but placed restrictions on their use without his permission. In the confused situation, Griswold had his armor and mechanized forces conduct spoiling attacks but avoid decisive

engagement as his infantry prepared defensive lines further to the south. Drum was deceived, however, and believed the armor and mech were occupying IV Corps' main line of defense. The I Armor Corps succeeded in disengaging, but unfortunately, Griswold's staff fell behind as in the first maneuver, and was unable to get orders out on time. Though unable to coordinate another attack, Griswold was able to withdraw and defend in relatively good order.

Once again problems at the staff level proved disastrous. In a planning mix up the 1st Armored Division withdrew from their defensive line with no infantry unit to replace them, leaving an eighteen-mile wide sector defended by a single brigade task force.[120] The VI Corps found this gap and drove along Griswold's exposed western flank to seize a key town behind Griswold's defensive line. Though an open path to the IV Corps rear (and the exercise objective) lay before him, Drum and his slower more methodical planning process and staff failed to recognize and seek to exploit this opportunity. Though reserves were available they were retained under Army control and VI Corps held its position.

After two days of trying to coordinate an armor attack into the gap between II and IV Corps (first detected by 2nd Armored Division), I Armor Corps finally succeeded in launching its attack. They penetrated First Army's lines and completely distracted Drum and his staff from their own penetration by VI Corps. Drum shifted focus to countering the armor threat, thus allowed Griswold and his staff time to reorient forces. They restored their defensive line and established a force to block the still open path into their

rear area. Drum's force (1st Division from VI Corps) that occupied this potentially decisive position on Griswold's flank was ordered to change direction and attack east rather than continuing their penetration to the south. First Division was stopped a short distance later by Griswold's defenders.[121] Griswold's attack by the two armor divisions, having succeeded in disrupting First Army, now withdrew and rejoined the delay operation. At the conclusion of the maneuvers, Griswold still occupied sufficient terrain to conduct his mission.[122]

McNair summed up the need to focus training on the men behind the technology rather than putting too much faith in technology alone when he said "Victories are won in the forward areas by men with brains and fighting hearts, not by machines."[123] As a postscript to the maneuvers, Patton and Fredendall, who participated in the maneuvers as commanders, have come to exemplify both the strengths and weaknesses of the training. To one, the maneuvers reinforced old thinking and old ideas, under the mentorship of a like thinking commander. To the other, it represented an opportunity to try new ideas and gain valuable experience, also under the mentorship of a like minded commander. Not only the commanders, but subordinate leaders, staff and the units themselves gained valuable experience. In later combat, both the strengths and weaknesses of thinking styles and unit training and experience impacted on battle command and battlefield results.

Kasserine Pass

In the first meeting of American forces against the Germans, GHQ maneuver veteran and II Corps commander Major General Fredendall and his staff fell victim to

both World War I tactics and thinking and an inability to visualize the battle to come on the desert terrain of Tunisia. His training under Lieutenant General Drum in the Carolina maneuvers did little to contribute to his experience with maneuver warfare. He and his staff were not one of the stand-out units of the exercise. Clearly there is more to deriving the maximum training value from an exercise or combat simulation than just being there or merely participating.

At Kasserine, II Corps was attached to the First British Army with a mission to defend the right (southern) flank of the Army until Field Marshall Montgomery could flank Rommel and the remaining forces of the Africa Corps and link up with First (Brit.) Army. Rommel however, realizing the U.S. forces had the least combat experience of the allied forces, saw an opportunity to regain the initiative.[124] Rather than defending in the more advantageous terrain in the passes, II Corps established positions in a deep ravine to the rear of the key terrain. In a tour of the defensive preparation General Eisenhower found that after two days of defensive prep mines had not been emplaced and corps engineers, rather than assisting with the defensive prep forward, were digging a cave into the side of a mountain for the protection of the corps staff.[125] The corps also chose to defend along the valley floor and left undefended the high ground above the valley and the wadis on the far side of the high ground that provided concealed access to the higher ground. German attackers used these routes to occupy the high ground, destroy Fredendall's anti-tank forces, and then roll through the defending infantry with their armor along the high-speed avenues through the valley floor.[126] Fredendall created a stir

when, in an attempt to shorten his lines and shore up his defense, he proposed opening a gap between II Corps and the French XIX Corps to his north, exposing the French flank to the German attack.[127] The French were furious. Unlike the Carolina maneuvers, where II Corps opened a gap which armor forces exploited, Fredendall was not allowed to withdrawal. Due in part, however, to the rift created with French allies, he was relieved of command and replaced by Major General Patton.

Patton and Third U.S. Army

Patton, a veteran of both the Louisiana and Carolina maneuvers, went on to lead the Third Army in the ultimate test of staff synthesis and skill during the Battle of the Bulge. It is interesting, however, to note his actions in turning around II Corps following the battle at Kasserine. With only eleven days before the corps was to participate in an attack, Patton brought with him several key staff officers from his previous command to assist, including his G-2. While he personally visited every battalion-sized unit of the corps his personally trained staff officers prepared for the next mission knowing, based on training and experience, what the commander would want.

After assuming command of Third Army in 1943, Patton followed a similar pattern, bringing with him key staff officers from 7th Army and other assignments. By 1944, every key staff officer except the G-1 and several special staff officers were Patton veterans from earlier assignments. His G-2 had been with him since stateside training prior to Operation TORCH. Though Third Army went through several cycles of staff personnel changes since the GHQ maneuvers, there were still several officers remaining

from those days as assistant and subordinate staff officers. As in 2nd Armored Division, Patton was personally involved in staff training and at this point had a high quality, high performing staff that exemplified the staff-level goals of exercises such as the GHQ maneuvers. The commander's and staff's awareness of the developing situation in the Ardennes in the winter of 1944, represented what is now call battle space. Though outside their immediate area of operations, actions there had the ability to impact their operations, and they likewise intuitively recognized their ability to impact operations there. It was achieved as a result of a commander and staff finely attuned to not only their situation but of critical developments on their flanks. The pay-off of the finely oiled command and staff synergy of Third Army was the mental flexibility and agility to develop and issue the orders necessary to rapidly reorient forces for an anticipated but unplanned operation. The unit's ability to conduct a long road march and then immediately commit to combat at a critical time and place was supported by the staff's actions.

Conclusions

This review of some of the history involved in the transition of primarily U.S. and German armies from the dismounted infantry tactics of World War I to the evolution of faster paced warfare characterized by blitzkrieg and a new form of mechanized warfare provides several key lessons.

Though the tools and technology of war change, as George Patton so eloquently observed, the men who fight these wars generally do not. Just as success is said to have a

thousand fathers, but failure is an orphan, the small cadre of dedicated visionaries who fought and worked for change appears larger in retrospect then it actually was. Guderian worked long and hard to bring his ideas and theories to fruition. Despite his great skill, and the adulation military history awarded him, he did not accomplish his vision alone. A higher ranking mentor and a cadre of junior officers in whom he invested his time and effort to personally train and educated them in his theories helped him. His technique of using history as a teaching took, and a penchant for focusing on the hard lessons of lost battles rather than the more self-congratulatory lessons of victory was apparently successful.

Even as his ideas gained acceptance, there were still many senior officers and peers who sat on the fence, disbelieved or opposed the direction he was taking. To accentuate Patton's point about the consistency of men, even Machiavelli talks of the struggles of those who propose change, lamenting that they receive only lukewarm support from those whom their ideas would benefit, and the opposition of those who stand to lose resources and prestige. Guderian weathered the setbacks and outright embarrassment suffered by his fledging panzer forces during unopposed operations in Austria and Czechoslovakia. Though even good ideas suffer failures, mistakes and setbacks, he used the mistakes as training opportunities that further improved not only his unit, but his concepts and vision as well.

Both armies suffered from those who clung to the past or focus more on parochial interested rather than looking at the bigger picture. Though in some cases those who

argue against change can provide a safeguard to moving too fast by forcing innovators to flesh out and articulate their ideas, they can also serve as Luddites and impediments to change. The French learned the hard way that their approach was incorrect. In the U.S., though Patton as a cavalry officer was free to write about his ideas and share them with others, his friend Dwight Eisenhower, an infantrymen, was ordered not to write articles about tanks and mechanization. Infantry and Cavalry fought over new technology and ideas here just as they did in Germany.

The study of history and the broad perspective on military operations gained by viewing operations both vertically over the years and centuries to develop a broad database or frame of reference and horizontally by studying not only your own force but those of your enemies or potential threats stands out as a key tool in the cognitive development of the military mind. The most successful German and American leaders--Guderian, Marshall, Patton, Rommel, Krueger, and others are united in a personal interest and professional study of history.

Eisenhower stands as testimony to German military writer Balck's observation that military history can serve as a substitute for combat experience in gaining an appreciation for the tactical art. Though not a veteran of World War I, Eisenhower and his friend George Patton engaged together in professional discussion and study of history as well as current developments in armor and mechanization. His lack of combat experience did not hurt his ability to demonstrate initiative and innovation on the battlefield of the Louisiana Maneuvers. More senior officers, like Lloyd Fredendall, who

had combat experience but lacked the same opportunities as Eisenhower and Patton to study, were at a disadvantage. Officers like Patton and Krueger worked hard not only to maintain their professional edge, but to train their staffs as well. Where Eisenhower had the opportunity to work and learn under Krueger during the Louisiana Maneuvers, Fredendall was far less likely to learn any new skills under Drum, who though admittedly an excellent leader, had done far more to perfect the tactics of World War I than to adapt to and anticipate the tactics of World War II. The references by historians to the knowledge of history and emphasis on staff training made repeatedly for officers like Patton and Krueger are noticeably absent for officers like Lear and Fredendall.

War gaming also stands out as both a tool for training and planning operations. Though the Louisiana and Carolina Maneuver were large scale war games, our lack of experience in war gaming per se, particularly in the Army, negatively impacted on our ability to fully leverage this excellent form of training. A more mature experience in war gaming might have prevented the personality and politically driven rules of engagement for anti-tank weapons imposed by McNair. His insistence on a free-thinking OPFOR, and Krueger's well thought out After Action Reviews, however, were significant and innovative initiatives, which have become part of our institutional training strategy, and still yield fruits today at our CTCs. The greater and more in depth German experience with war gaming certainly contributed to cognitive development and the ability to visualize operations by a broad base of officers within the German Army.

The Japanese credited their use of the Prussian war game with helping in their victories over the Russians in 1905. Extensive war games conducted by the United States Navy in the interwar years of the 1930s so thoroughly considered all possible course of action and contingencies in naval action in the Pacific that Admiral Chester Nimitz observed that the only Japanese action that had not been previously considered or thought out was the use of kamikaze suicide attacks.[128]

Despite these successes, however, it is important to note that it is not the war game per se that leads to success, but rather the cognitive skills and the quality of intelligence, information and perhaps imagination that the players bring to the table. Despite a system that instituted excellence, the German Army too fell victim to mental stagnation and perhaps "group-think." In war gaming before World War I, the staff lacked the imagination necessary to consider French movement on the flank, the landing of the British, or the involvement of Belgium. Though the Japanese war gamed the bombing of Pearl Harbor, they failed to consider the impact of the absence of U.S. carriers. In war gaming of the battle of Midway, their results showed they would lose several carriers, but they went forward with the operation anyway.

A risk in war gaming is that, as McNair allowed in the GHQ maneuvers, rules can be bent or false assumptions made that skew the results and reduce the training and planning value of this tool. The value in these exercises is the information gained, the consideration of unforeseen contingencies, the expanded perspective and point of view gained. As with history, this tool--used properly--is a valuable aid to the cognitive

development of skills such as visualization, conceptualization, and through the process of developing orders and executing them, of information assimilation, communication, and decision making.

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CHAPTER 3

PRESENT DAY PERSPECTIVE

> Training is the cornerstone of readiness--it is the top priority for the Total Army.[1]
>
> General (R) Carl E. Vuono, FM 25-101

Compared to sifting through the historical information necessary to draw conclusions about battle command and the training of battle command in the 1930s and early 1940s, study of current day lessons is the academic equivalent of drinking from a fire hose. This lesson alone shows clearly our transition to a new age of information. But the Clauswitzian phenomena of the fog of war that was endemic to earlier ages of information scarcity has not gone away. It has been supplanted by a more challenging and time consuming information-overload that further complicates the decision making process at the brigade as well as superior and subordinate levels.

As in earlier ages, there is only one way to overcome the confusion and uncertainty created by too much or too little information. Training, experience, and the discipline to turn information into knowledge have been the sure path to overcome these problems. Leaders and military theorists as varied as Sun Tzu and Napoleon have identified the need for knowledge, disciplined analysis, and thought rather than just information as keys to success in military decision making and the operations they spawn.

Another sign of transition to new ways of conducting warfare is the concept of battle command, which evolved from an older concept of command and control and the

even earlier root of command itself. The age of Thomas Jefferson, in which one man could seek to know all that was known and actually have hope of achieving that goal, is gone. Commanders alone cannot perform the functions of battle command. How well they and their units execute operations will depend on the training, experience, teamwork, and decision making skills within the overall team.

How well they perform may also depend on cognitive skills, such as how they think. Independent of ideas such as critical thinking and thinking styles such as those examined in the Myers-Briggs test, George S. Patton Jr. recognized the need for diverse thinking in a staff and commented, "if everyone's thinking alike, then someone isn't thinking."[2] The feats of Patton and his staff in 1944 in disengaging Third Army and turning it 90 degrees to counterattack represent the synergy of battle command we seek in present day and future forces. But it took Patton over two years to build that synergy. It included personnel stability rarely seen today. It is a standard to which present and future training may aspire. But without a dedicated training program and serious commander involvement, it will be a difficult vision to achieve.

In the discussion below concerning unit performance of battle command at the CTCs, it must be noted that in the future, as in the past and present, commanders and staffs will still only have the power to either lose battles or set conditions for success. Despite the current and future wonders of digital technology, the path to victory in ground combat will remain the occupation of that ground by soldiers in units at the lowest level. This point is perhaps best exemplified by an operation during the Vietnam War to

sever the enemy's critical line of supply--the Ho Chi Minh Trail--through bombing. After dropping 600 tons of munitions at a cost of about $21 million, the trail was disrupted for two days. Though new weapons are changing warfare, they will also increase the numbers of possible tasks, which must be performed. Not all old tasks and skills go away as new tasks are being added to the list.

Battle Command

Battle command is recognition of the increasing complexity of combat operations at the tactical level. As experience from World War II showed, during times of transition there is likely to be years of debate over certain ideas and concepts. Battle command is one of these ideas. Introduced by several deep military thinkers in the 1993 revision of the Army's capstone manual for Operations, FM 100-5, it still generates some controversy. In the current draft of FM 100-5, doctrine writers proposed eliminating the term and replacing it with the simpler "command." Changing the name will not make the tasks it defines any simpler, though.

According to the team writing the new FM 100-5, many have complained that the term battle command is harder to understand. The term is, however, in concert with a concept that recognizes a new complexity on the battlefield. Just as the change from World War I tactics to the new dynamic of mechanized and armor tactics brought conflict and discussion, so apparently too has the idea of Battle Command. Calls for a name change may actually be a call to roll back the clock to simpler times. But changing the name does not bring back simpler times. As in the 1930s and 1940s, we must adjust our

thinking, our training and where necessary, our organizations and equipment to adapt to the new environment we face. The term battle command and the concepts it represents are expected to remain a part of FM 100-5.

Despite controversy, battle command, or something like it, will remain a task or function which commanders and staffs at the brigade-level will have to train, execute and excel at in both current and future operations to remain successful on the battlefield.

TRADOC PAM 525-5, Force XXI Operations, defines battle command as the art of decision making, leading, and motivating soldiers and their organizations into action to accomplish missions: it includes visualizing current state and future state, then formulating concepts of operations to get from one to another at least cost; it also includes assigning missions, prioritizing and allocating resources, selecting the critical time and place to act, and knowing how and when to make adjustments during the fight.

Battle command recognizes the changes brought about by digitization and increased information on the battlefield. FM 100-5 states:

> . . . the magnitude of available information challenges leaders at all levels. Ultimately, they must assimilate thousands of bits of information to visualize the battlefield, assess the situation, and direct the military action required to achieve victory. Thinking and acting are simultaneous activities for leaders in battle. Visualizing the battlefield is a continuous requirement for commanders.

The six dynamics of battle command identified by the Battle Command Battle Laboratory help to expand the depth and meaning of future battle command. They give an idea of the interaction between commander and staff needed to achieve the promised

synergies of new technology introduced into our current and future operations. These synergies were difficult to achieve in World War II with what was then new technology, and are no easier to achieve now. Without concerted efforts to correct these deficiencies, they will be no easier to correct in the future.

As with the promise of mechanization in the 1930s, digitization holds great potential and great promise. But extracting this potential must be a deliberate and on-going effort. The cautionary tale of the French Army of 1940, which arguable possessed the better technology and in larger quantities, was defeated by the lessor equipped but more mentally agile foe.

Digitization increases the potential sources and flow of information to the warfighter and may free commanders and staffs for more hands-on leadership. It may decrease planning time--or at least increase its quality—and allow brigades to leverage existing combat power and increase their ability to synchronize combat power rapidly from dispersed locations to decisive points on the battlefield.

But digital systems will not do this alone. Though they may cause evolution in the staff structure as we currently know it they will not replace commanders and staffs. Commanders will continue to exercise the leadership in life and death situations that distinguish them from their civilian corporate counterparts. Staffs will still be needed to filter and focus the information, as well as to focus the collection and dissemination system necessary to support subordinate warfighters at the tip of the spear. The computer science rule of "garbage in, garbage out" still applies.

Without commanders to provide the focus and direction that drives what in effect is a large information system, and without a bevy of staff officers, technical experts, and the communications and information processing networks at multiple echelons that support that system, the information needed to cut through the fog of war and focus both munitions and combat power with the precision of a laser beam may not be where it is needed when it is needed.

Achieving this potential is extraordinarily difficult. In his collaborative work with General (R) Fred Franks, *Into the Storm: A Study in Command*, author and military technophile Tom Clancy observes "the sheer intellectual complexity of command is something few have discussed with anything approaching accuracy."[3]

But identifying that there are habitual problems in battle command, making some doctrinal shifts to account for the period of transition we're in and mastering new doctrine are actually three different things. Current trends and observations from all our major training centers show we still have a ways to go, both now and into the future in mastering these new skills.

Recent Problems

Perhaps the greatest problem faced at all levels, to include the brigade, is the human tendency not to address new and future problems in preparing for the next war or conflict, but rather trying to take the more familiar (and easier) path of trying to refight the last war and "making yesterday perfect."[4]

A review of lessons learned from the CTCs on file with CALL show current problems in battle command falling into each of the six dynamics of battle command: leadership, decision making, information assimilation, visualization, conceptualization, and communication.

The greatest problems, or the ones occurring most frequently, appear in the areas of information assimilation, decision making, communication, and visualization. Fewer problems are documented in conceptualization and leadership. As discussed in chapter one, the areas of conceptualization and leadership are most frequently associated with the commander. The seniority and experience of the commander can be expected to correlate with a lower incidence of problems in these areas. However, the ability of this key leader to leverage his skill and experience depends on the training and skill of the staff officers. In the words of one brigade level commander, "Without an effective staff, the commander will never command to his full potential."[5]

Though CTC results indicated a lower incidence of problems in the conceptualization and leadership areas of battle command, they clearly indicate persistence and recurring deficiencies in other areas.

Though much more difficult to quantify, the nine tenets of battle command also provide a framework to examine deficiencies seen at the CTCs and BCTP. These tenets are: initiative, agility, depth, integration, versatility, flexibility, judgment, intuition, and empathy. Integration is most clearly identified in CTC lessons learned, particularly in its relation to the synchronization of effects units seek--but frequently fail--to achieve by

integration. Versatility falls beyond the scope of most CTC rotations to examine. Judgment and empathy can be inferred from the results of some battles, but is not discussed in CALL materials. Some observations can be made about initiative, agility, depth and flexibility, but these too are usually included in decision making or inferred from descriptions of a given battle.

Experience at the CTCs indicate several recurring areas of deficiency. It is not surprising to see that several of these areas correlate with deficiencies observed in peacetime and pre-combat training exercises in the 1930s and 1940s. Given the inherent difficulty of certain tasks critical to battle command--including those from different time periods by different armies using different equipment--it is reasonable to assume that some, perhaps all, of these deficient areas will apply in the future.

Though multiple products are available over a period of several years from CALL, the simplest and most telling is the trend analysis produced for the NTC in FY 97 that analyzes trends from FY 94 to FY 96. Though research included CALL products from all CTCs, this trend analysis shows the occurrence of certain deficiencies over several quarters. A representative sample of finds from all CTCs is found in the Appendix.

A striking similarity between our World War II era maneuvers and present-day forces are failures to effectively task and employ reconnaissance forces, a key element of gathering the intelligence necessary for operations and for achieving information dominance. After action reports for Third Army maneuvers in Louisiana in 1943 note not only a failure to use all available agencies for reconnaissance to collect information, but a

shortcoming in the use, analysis and dissemination of what information was collected as well.[6] Similar observations are found in CALL publications from all three training centers as well as the BCTP program. A senior defense analyst providing input for congressional staffers made a similar observation as recently as December 1997, noting that "there was little reconnaissance out before the attack."[7]

In the NTC trend analysis, "reconnaissance and surveillance (R&S) plan development" received a rating of "needs emphasis" for four out of five quarters.[8] This trend actually affects both decision making and information management aspects of battle command. Not only are assets not properly tasked or focused, but the Priority Intelligence Requirements (PIR) used to focus the overall intelligence collection and production effort are rarely changed or updated. Even in the present day digital environment, these tools and tools like them help to ensure we do not waste time collecting, receiving, analyzing or reviewing information we do not need. It can, if properly used, provide a filtering of information that helps guard against information overload.

Another observation on this trend is the lack of commander involvement and a tendency for the S3 and other members of the staff to delegate R&S to the S2. This could be inferred to show a "last war" thought pattern, thinking outdated for the current state of affairs--analogous to commanders who adopted slow, set-piece World War I paced attacks during the GHQ maneuvers of 1941. In present day and future operations, everyone needs information. This critical task and function must be shared and coordinated among multiple staff members. Though information requirements and the ability to si-

multaneously distribute to multiple commanders and staff members may begin to blur boundaries between staff sections and emphasis a greater need for each to share information with others, this is not a new lesson or one unique to the information age. In 1946 a compendium of intelligence lessons learned from all theaters and echelons of World War II observed "no military operation, however small, can succeed unless all staff work is coordinated."[9]

Observations on the Intelligence Preparation of the Battlefield (IPB) process in NTC trends observed "need improvements" or "negative trends" in five of five observed quarters. This area too includes multiple aspects of battle command. In addition to decision making, the knowledge and information IPB provides about the enemy, weather and terrain is essential to an ability to visualize the battlefield. In the terms on an ancient theorist, Sun Tzu, this is 50 percent of his famous know thy enemy and know thyself formula for battlefield success. A more modern theorist explains "information in regard to the enemy's situation and the terrain is indispensable to the decisions of the commander."[10]

The NTC trend analysis, though covering a variety of units to include rear area IPB in FSB and IPB in the Field Artillery Battalion, also covers such items as commanders and staff failing to conduct a complete IPB, or omitting detail needed to focus friendly course of action development and the commander's estimate. Brigade commanders and staffs need improvements to execute current battle command, let alone the more ambitious maneuvers of Force XXI and Army After Next (AAN). Better training and experience in

the execution of the multiple building blocks and cognitive skills that battle command calls for is needed now, and will be needed more so in the future.

Without information on the enemy and terrain visualization of the battlefield becomes more difficult. Visualizing is necessary to see three-dimensional battle space as it moves across the terrain as the battle progresses in space and time. From this and other knowledge comes the ability to plan a flexible operation, and provide for the initiative and agility we seek in operations. Repeated practice can increase both knowledge and experience and increase intuition and empathy as well.

A seasoned combat commander aptly describes this ability. It is essential to our doctrinal tenet of synchronization or the ability to arrange activities in time and space to mass at a decisive point. To get there, however, requires skill. General (R) Fred Franks Jr. describes this as "the ability to picture operations in his head, and to judge time/distance factors to get the right units in the right combination at the right place at the right time."[11] But in addition to training and experience, there are clearly elements of cognitive thinking at work that go beyond traditional training.

> The training and some excellent mentors had a lot to do with the honing of his ability, as had the crucible of Vietnam. But it was not only a matter of practice and experience; it also had to do with the way the brain worked--with imagination.[12]

Though negative trends in the Intelligence Operating System represent the criticality of information management to battle command, there are other needs improvements

that impact on other areas of battle command. Course of action development and the wargaming step of the decision-making process were negative trends four out of five quarters. As with the intelligence trends, this is merely a separate piece of the same puzzle. Without a picture or "visualization" of the terrain and enemy, the friendly COA is more difficult to develop. Without the knowledge of both friendly and enemy situation, Sun Tzu warns, units face defeat. The same knowledge, skills and information are essential whether assembled on a digital system or a sand table. Without effective management of friendly, enemy, and environmental information the plans and decisions needed to execute tactical operations are more difficult. And as the trends indicate, so is victory.

Rehearsals, designed to help ensure the integration/synchronization of an operation, with the added benefit of helping to communicate and aid in the assimilation of key information, showed a negative trend in four of five quarters. The Tactical Decision Making Process (TDMP) itself rated a negative trend five out of five quarters. In one quarter, the assessment bluntly stated "battle staffs lack the training required to conduct the tactical decision making process."[13] Lack of coordination in R&S, targeting and other areas of synchronization are not limited to current application of the process. In similar trends from 3rd Army maneuvers in 1943, observers noted that though some improvement were seen in "staff cooperation and coordination," there was still "too much 'one man staff' work."[14]

Though many more examples are available, these illustrate the present state of tactical battle command as shown by trends and performance at our CTCs and in the BCTP.

The consistency of many of these trends to observed performance during peacetime and pre-combat training in World War II also provide a basis to assume that many of these problems are related to the uniquely human factors of the battle command process. The application of new and better machines and digital technology will still be faced by many of the same human challenges faced in both the past and present.

In looking to solutions to these problems, NTC trends are rather consistent in recommending home station training as the remedy. Unfortunately, adding a rather large laundry list of home station training objectives to already crowded training calendars with out introducing new resources or some form of training support will face difficult prospects of success.

Training

Perhaps the most insightful comments are provided by a participant in the Army's Advanced Warfighting Experiment (AWE), designed to gain practical experience in the training and application of our newest technology to perhaps some of our oldest problems.

"Vastly improved situational awareness did not necessarily lead to better situational understanding. Battlefield command, with Force XXI technology, has great potential but demands radical new thought in how we will train future leaders."[15]

In seeking radical new thought, it is helpful to have a foundation in the older and more traditional ground from which new thought grows. In looking at the cognitive domain, Bloom's Taxonomy is a common hierarchy for looking at the progression of skills

involved in knowledge and the development of intellectual abilities and skills. Cognitive behaviors are classified in six categories ranging from fairly simple to more complex levels, as shown in figure four.

Knowledge	Remembering; memorizing; recognizing; recalling
Comprehension	Interpreting; translating from one medium to another; describing in ones own words
Application	Problem solving; applying information to produce some result
Analysis	Breaking something down to show how it is put together; finding the underlying structure of a communication; identifying motives
Synthesis	Creating a unique, original product that may be in verbal form or may be a physical object
Evaluation	Making value decisions about issues; resolving controversies or differences of opinion

Figure 4: Six Levels of Bloom's Taxonomy[16]

Studies at the NTC by the Rand Corporation, though focused on company commanders, looked at cognitive skills and agreed that changes in training are needed. The "cognitive ability to visualize the battle" is singled out as a key skill that is deficient in many of our young company commanders. Noting that fewer than half of the commanders observed demonstrated consistent adequacy in "complex planning activities," there was a high correlation between those who did and those who experienced success in the execution of their operations.[17] Much of the training needed to improve these skills, they note, could be done in a classroom or home station environment. Rand notes, however, that "complex cognitive skills are often taught in a stepwise fashion," that is, basic skills must be

mastered before students can assimilate more advanced tasks. Provided students have a foundation in the comprehension and application skills necessary for the tasks of battle command--such as a knowledge of military terms and graphics, the ability to read military maps, familiarity with U.S. and threat weapon systems and capabilities, etc.--the Rand study believes the presentation of complex and realistic battlefield scenarios by qualified and competent instructors using simulations integrated as part of an overall unit training program, including leadership and field exercises can allow units and their leaders to "develop the ability to reach an Analysis and Synthesis level of knowledge."[18]

It is not just military leaders, but educators as well who recognize the need for new thought in training and education. One trainer notes that in teaching adults, placing them in a classroom of "30 chairs facing forward" almost instinctively conditions them to act "like bored 12-year-olds."[19] The traditional and easy to set up classroom is clearly not the optimal configuration for training the higher order skills needed for battle command.

Research shows that in teaching adults, "information conveyed through storytelling is more than entertaining" it also appears students are better able to learn, remember and relate new information to knowledge they already have when presented this way.[20] Relating tactical lessons in terms of historic examples may be one technique for applying this lesson in a military training environment.

Though the CALL database of lessons learned is an extremely valuable tool, as are the take-home packets (THP) prepared at the CTCs and in BCTP, they are apparently

not used to their full effect. Though beyond the scope of this study, the problem could be in the format and accessibility of the information. There is more to a knowledge base than simply placing large volumes of information on-line. In many ways, the internet, though a valuable resource, is still in its infancy. Data searches can call up tens of thousands of documents, and are time consuming. A new format might make these products more usable and accessible. An information age THP might be on CD ROM or distributed to the unit via a network or limited access intranet site. It immediately becomes more accessible to anyone in the unit from a private to an incoming commander. It could provide more comprehensive access to information as well. An observation noting problems in course of action analysis, for example, might include hyperlinks to doctrinal references, video clips from AAR discussion of this topic, video clips of the staff during wargaming, links to other AARs that addressed the same topic, links to the slides and instructional material used to train this topic at each of the branch schools, or even links to civilian instruction on this same topic. The possibilities are limitless.

That instructor and doctrine writers, and many others, could use the same database goes beyond brigade battle command, but helps demonstrate the synergies of effectively formatted and shared information.

A knowledge base that links training observations with related historical vignettes or examples, doctrinal references and copies of instructional materials on the topic from CGSC, and branch schools might be of use to units in the field trying to leverage existing knowledge when putting together unit professional development classes, training materi-

als, or just trying to keep up with professional issues on their own time. When linked to e-mail discussion groups that connect doctrine writers with trainers and those trying to execute it, further synergies of information could be realized. Though forums like this currently exist, they must be further developed and their potential expanded.

In a search for solutions the next chapter looks at how the private sector has faced the challenges of the information age. This challenge includes not only the new problems created in this period of transition but older problems that pre-existed the transition and have been aggravated rather than solved by new technology. The private sector faces the many of the same challenges of the digital age as the Army does. The challenges are expressed by one brigade commander who lamented that "Training staff soldiers is the toughest challenge for a commander today."[21]

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[1] Carl E. Vuono; quoted in *FM 25-101, Training the Force, Battle Focused Training* (Washington, DC: HQ Department of the Army, 1990), 1-1.

[2] George S. Patton Jr., as quoted in *Great Quotes from Great Leaders* (Lombard, IL: Celebrating Excellence Publishing, 1990), 123.

[3] Tom Clancy with Fred Franks, *Into the Storm: A Study in Command* (New York: G. P. Putnam's Sons, 1997), x.

[4] Gordon R. Sullivan and Michael Harper, *Hope is Not a Method: What Business Leaders Can Learn from American's Army* (New York: Broadway Books, 1997)

[5] Larry D. Harmon and Shawn O. Cupp, "A Commanding Battle Staff," *Army Logistician*, Jan/Feb 1998 (Fort Eustis, VA: Army Logistics Center)

[6] Final Report, Third Army Maneuvers, (Fort Sam Houston, TX: HQ Third Army, February, 1943)

[7] Winslow Wheeler, *Report on Staff Trip to Army Training Facilities*, e-mail to Bill Hoagland, Staff Director, Senate Budget Committee, (11 Dec. 1997)

[8] *NTC Priority Trends - 4Qtr FY 94 - 2QTR FY 96*, (Fort Leavenworth, KS: Center for Army Lessons Learned), N-1.

[9] Stedman Chandler, and Robert W. Robb, *Front-Line Intelligence*, (Washington, DC: Infantry Journal Press, 1946), 26.

[10] William Balck, *Tactics*, trans. by 1LT Walter Krueger, (Westport, CT: Greenwood Press, 1914), 251.

[11] Clancy, 15.

[12] Clancy, 15.

[13] NTC Priority Trends, N-49.

[14] Third Army Maneuvers, 1943

[15] James J. Grazioplene, "Army Warfighting Experiment," e-mail copy of memorandum, 25 May 1997, (Fort Irwin, CA: NTC), 10.

[16] B.S. Bloom, ed., *Bloom's Taxonomy: A Classification System for the Cognitive Domain*, (New York: David McKay Company, Inc.), 89.

[17] B.W. Hallmark, and J.C. Crowley, *Company Performance at the National Training Center: Battle Planning and Execution*, (Arroyo Center, CA : Rand Corporation, 1997), 56.

[18] Hallmark, 61.

[19] Ron and Susan Zemke, "Adult Learning -- What do we know for sure?", *Training*, June, 1995, 33.

[20] Zemke, 34.

[21] Harmon, 2.

CHAPTER 4

INDUSTRIAL AGE TO INFORMATION AGE TRANSITION

How do you manage the human imagination?[1]

Tom Peters, *Liberation Management*

The Army faces an era where economic issues have replaced security issues at the forefront of the national agenda. Not only are government resources being diverted from defense and military purposes in search of peace dividends, but tremendous wealth funneling into the stock market fuels both technological growth and business expansion in the greatest bull market of the postwar era. Military leaders, units, and institutions can learn and benefit from corporate managers and executives who tackle many of the same issues the military does, though with a more profit-oriented focus.

The military pioneered the information age. But consolidation of defense industries, new emphasis on off-the-shelf technology, and a shift of resources to the private sector indicate the new center of gravity, source of growth, innovation, and wellspring for new solutions in moving towards the next century may well lie in the boardrooms and drawing boards of corporate America.

Unlike the interwar period in the 1930s when the transition to mechanization merely aided a depressed economy in getting back on its feet--though laying the groundwork for postwar growth in the late 1940s--the current transition to digitization places the private sector and the military are almost equal partners. No look at future training

for the military, particularly in skills in which the information age has equally affected both military and civilian organizations, such as information management, decision-making, and leadership, can fully appreciate the impact of the information age without reviewing how the private sector is making the same transition.

Training

The Second Annual Worldwide Lessons in Leadership Series, held physically at Fanuil Hall in Boston, but virtually across one-hundred sites in the U.S. and in thirty countries worldwide helped illustrate both the form and content of change in business perspective as they continue to transition into the information age. A pickup truck towing a small satellite dish and a few suitcases of electronic equipment easily and almost effortlessly turned a Kansas City movie theater into a form of electronic classroom. Internet access and phone links provided a degree of interactivity between the primary and remote sites. A wide range of local managers and executives from various echelons in the telecommunications, banking, manufacturing, and other industries, as well as military and civilian participants from Fort Leavenworth and the Center for Army Leadership, attended the training event. The virtual-faculty gathered by event sponsor *Fortune* magazine included not only CEOs from Hewlett-Packard, Gillette, and Stanley Tools, but business authors, graduate professors from Harvard, other universities, and theorists such as Peter Drucker, Tom Peters, Peter Senge, Stephen Covey, and others.

Technology allowed entire industries to leverage the knowledge and expertise of many of the leading minds in business leadership theory. Where this knowledge and ex-

pertise was once limited to only selected members of the highest echelons in corporate leadership, or physically limited by classroom size and available teaching days, now a legion of lower and middle level managers had access to the same expertise. More vividly than slogans or theoretical discussion, this seminar illustrated the ability and potential of technology to help business power-down and implement shared leadership by providing workers with the access to knowledge, ideas, and an external perspective to build new cognitive skills as well as leverage and build on existing skills earned in the workplace.

Peter F. Drucker, regarded by *Fortune* as the world's most influential management thinker, made a compelling case for the continuous development and training of leaders and managers at all levels. In the industrial age companies measured capital in terms of raw materials, physical plant, and real property. The shift to what Drucker calls the "knowledge society" and others refer to as the information age calls for new thinking. A key concept growing in the business world is the idea that people, teams, their knowledge and talents are the human capital of an organization. Like raw materials that can be processed to increase their value, the human capital of an organization can also be developed to yield increasing value. As organizations once invested money and resources into capital to acquire it, maintain it, and expand it, companies must now make similar investments in human capital. Viewing workers in an industrial age paradigm of "appendages to the machines, as costs rather than resources"[2] prevents full realization of the synergies of the information age and information systems.

Microsoft epitomizes a firm that depends on human capital and the imagination, creativity, cognitive, and technical skills of its workforce rather than raw materials for its livelihood. Chairman Bill Gates acknowledged the value of developing this capital when he titled an entire chapter "Education: The Best Investment" in his book *The Road Ahead.* Here he describes a workplace of continuous learning completely alien from images of the assembly line or of nine-to-five workers.

> At Microsoft we read, ask questions, explore, go to lectures, compare our notes and findings with each other, consult experts, daydream, brainstorm, formulate and test hypotheses, build models and simulations, communicate what we've learned, and practice new skills. These are the same activities that go on in the best classrooms . . . . Microsoft succeeds because its employees learn efficiently, in part by using information tools.[3]

In a business environment where any business can be as good as any other business, Peter Drucker believes the only difference between excellent firms and others is "how they develop their people."[4]

At the leadership seminar Drucker illustrated his point with the story of a successful Japanese CEO who believed that "my business is to develop leaders."[5] Part of the culture the CEO encouraged in his company was one of continued growth and continued learning in both personal and professional areas. He exemplified his emphasis on balance between personal and professional growth through his accomplishments as an amateur musician. Though he encouraged the development of diversity in his subordinate leaders, he also demanded that they develop their people as well. The CEO further set up a system that rewarded and recognized the development of leaders. He noted that though

his subordinates received promotions for their performance, it was not performance that garnered bonuses and extra pay. Developing future leaders, he said, would "pay extra and generously."[6]

Professor of Strategy and International Management at the London Business School Gary Hamel adds to the imperative of a changed paradigm for training by observing that firms must work more on their ability of developing foresight, rather than the more typically seen ability for hindsight. This type knowledge calls for "revolutionaries," he says, noting that firms will have to "borrow competencies from outside your industries."[7] He implies a need to inventory or evaluate the skills employees have, observing that "in a knowledge economy, we better be able to measure our knowledge assets."[8]

The ongoing shift to a knowledge economy will also require changes in mindset and attitude about how businesses and senior leaders view training. In many minds, he observes, "there used to be an artificial distinction between learning and work." Particularly in an environment when what we learn today may be obsolete in 3 to 5 years, "work and learning must be integrated." Senior leaders and executives must recognize that "learning *is* real work," he said.[9]

A commitment to real training and knowledge development is more than buying computers and new technology, though these are important steps. It requires a concept that is linked to the core competencies and functions of an enterprise to ensure that the various means of imparting information and knowledge have access to quality instructors

and quality content, in an environment that encourages an interchange of ideas and a synthesis of information. The Dean of American quality theory, Dr. Edward Deming warns that "money will buy gadgets; it will not buy knowledge."[10]

In an environment seeking imagination and creativity from its workforce, companies must also look beyond narrowly focused specialty training. Drucker observes that what modern managers need is not what they're getting at business schools. "Management," he says, "is what tradition used to call a liberal art . . . it deals with the fundamental of knowledge, self-knowledge, wisdom and leadership." Business leaders seeking to practice this art effectively must be well grounded in technology, humanities, liberal arts, psychology, philosophy, economics, history, the physical sciences and ethics.[11]

War Games

Interestingly, business has begun to borrow a page from the military's play book in the training of leadership and decision-making through the use and application of simulation. War games, which can trace their roots to 3000 B.C. when military theorist Sun Tzu created the game of Wei Hai, are moving from the battlefield to board room as a tool for training business students, corporate managers and executives.

Bell Atlantic CEO Raymond W. Smith believes current management systems fail to prepare executives for the essence of management success on the threshold of the twenty-first century--"making decisions in the midst of complexity."[12]

In the complex world of the information age and into the future, Smith believes management systems must do four things:

1. Allow managers to analyze the impact of conflicting and sometimes contradictory forces

2. Eliminate the blind spots that prevent managers from seeing all the consequences of their decisions

3. Help managers change direction as the environment changes.

4. Do all this in real time; allow the organization to remain limber enough to move at exactly the right moment--and not a moment later.[13]

In seeking an analogy for the current and future state of business and management--and more directly a direction for his vast telecommunications corporation-- he, like Peter Drucker, rejects the bookish environment of modern business schools. Smith turned instead to the world of World War II British naval officers in their life-and-death struggle against German submarine commanders. Their application of "game theory" in developing tactics in the fluid and flexible environment of submarine warfare impressed Smith. In their process, the telecommunications CEO saw "the kind of flexible decision-making structure required in the modern corporation."[14]

But the process alone is not sufficient to reap the benefits of game theory. Smith recognized that simply importing the process, following its steps as one follows a checklist, would not yield the sought-after corporate agility and foresight. "The game theory approach to business strategy also requires a different kind of corporate manager: flexible, intellectually rigorous, and highly tolerant of ambiguity. It takes a special kind of

manager to revisit decisions constantly and reverse course, even at the risk of personal embarrassment and exposure," Smith explained.[15]

Changing mindsets is part of gaining acceptance for new programs and new ideas. Smith recognized that human psychology and the cognitive skills executives bring to decision-making are factors in the success or failure of corporate endeavors. "Most successful executives are temperamentally unsuited to second-guessing their own decisions," he candidly admitted. "Once they set out on a certain path, they become emotionally invested in their own assumptions and come to believe that further analysis breeds waffling and indecision."[16]

In a process called "performance assurance," Bell Atlantic uses a senior-level executive apparently well versed in the lessons and techniques of "game theory" to provide overwatch of the major corporate priorities and to work directly with the corporations operating units to "keep us from marching resolutely down blind alleys," says Smith.

A key technique employed to improve competitive techniques at Bell Atlantic is quite literally war gaming. Managers are assigned to teams "representing major competitors." These teams then plan the strategies competitors would use to gain an edge on Bell Atlantic. In acknowledging another ancient war game, Smith explains:

> This team research increases our competitive intelligence and quickens our reflexes by building a competitive awareness into all our actions--rather like a good chess player is always aware of what an opponent will do in response to the next move.[17]

At the Purdue University Graduate School of Management two professors have collaborated to develop a business war game. Educators and students alike have lauded this technique for increasing and expanding the depth and realism of the learning experience. "The simulation is much more effective than a traditional training seminar or meeting," says Professor Shailendra Mehta. In an observation that indicates the utility of this training method in moving toward Peter Drucker's knowledge society, Mehta believes simulation "is a tool for knowledge formation."[18]

One of the most appealing aspects of simulation as a training tool is its ability to create a wide variety of scenarios and variables to force students to think, react, and respond to a realistic environment. In its use at Purdue, simulation is believed to be particularly suited to teaching the skills of decision-making and leadership in the present and future world of business. The professors believe a strength of their business war game as a tool is the setting of an interactive academic stage through creation of a "synthetic environment where people are free to make mistakes and learn from them."[19]

Through their iterative application of simulation to drive experiential learning, students go beyond mere application of what they have learned in a problem-solving environment to a level of synthesis in decision-making. Students are required to create new solutions to problems and future business scenarios. Through the use of multiple economic variables, the professors can generate a wide range of scenarios varying in complexity. The situations can range from mere surprise to chaos. It is not just the use of a

machine, however, that gives the game its learning and education value. The computer and technology of the simulation is really just the engine or driver for an educational situation.

"The human interaction between the players of the game helps make the simulation so unpredictable," explains professor Alok Chatuvedi, "The outcomes are changeable, and the game itself is a mirror of the real world."[20] Students are assigned roles and given limited information based on their role. Through the business war game, they are forced to interact and seek consultants to fill in gaps in their information. The power of technology helps expand the complexity of the simulation and the variety of situations for the professors to create by allowing the integration of both real and virtual players and consultants. The professors start the exercises with pre game briefings and end each exercise with an after-action report, which the professors believe "is probably the most crucial step to learning."[21]

Paradigm Shift

The emphasis that business experts are placing on training is driven by their observation of the current and anticipated future shifting of their business worlds and the global economy beneath their feet. Drucker warned of these changes in his 1989 work *The New Realities.* The shift to what he called knowledge or information organizations reduces the levels of management in an organization as well as the numbers and functions of traditional managers.

He illustrated his point with the example of a U.S. defense contractor. By simply asking the questions "what information do top corporate and operating managers need to

do their jobs? Where does it come from? What form is it in? How does it flow?" consultants identified as many as six of fourteen layers of unnecessary management. Though data was plentiful, it was often hoarded and used for control, rather than to inform. Many mangers existed simply to pass data. Interestingly, he notes that "information-based organizations" are not dependent on high technology. He classifies British organization in India as information based during an era when technology was the quill pen.[22]

For those who tie this change to new technology and believe things will level off or stabilize over the next few decades, U.S. Navy Vietnam veteran and business author Tom Peters warns that "the first thirty-five years of the information revolution was about paving cow paths."[23] Change is more likely to continue at its present pace, or even accelerate, before it starts to slow down.

The forms and roles of leadership itself are believed to be undergoing change as well. Leadership seminar participant Michael Hammer, co-author of *Reengineering the Corporation* and author of *Beyond Reengineering* states business leadership is not just "at the top of the tree," nor is it just reserved for the top of the organization. Organizations with leadership concentrated at the top are "too slow, too inflexible and too unresponsive" in today's environment. Successfully transitioning to a firm that can achieve the great potential of the information age, he believes "doesn't come free." Echoing the sentiment of London Business School Professor Hamel, Hammer emphasizes that "Learning is hard work!"[24]

Though the transition comes in part from senior leaders acting as role models and changing corporate reward systems, Hammer believes "most of all, it's achieved by education."[25] He warns that dramatic increases in training and education budgets are necessary. A dangerous thought, however, and one that still exists in many organizations is the idea that "learning and training and education" are looked at as "frivolous luxury, time off"[26] and irrelevant to the corporate bottom line.

One-Minute Manager co-author, former corporate executive and co-author of *Mission Possible: Becoming a World-Class Organization While There's Still Time,* Ken Blanchard, also believes in a shift to "post-heroic" leadership. "The concept of one single leader who can do it all is naive,"[27] he says. As other theorists have observed, the scope of what any single leader can know is reduced as ventures require and have access to more and more information. In keeping with an evolving concept of shared leadership, Blanchard opines that "a variety of skills and competencies are needed to create powerful leadership teams."[28]

Megatrends author John Naisbitt also sees a transition from top-down, hierarchical, industrial era leadership to one of shared and distributed leadership. Along with this shift, he believes, comes a new and growing need for creativity. Naisbitt sees the need for that same creativity to be applied to the quality of education and the quality of training. Echoing the sentiment of other business leaders and theorists, he notes that in a global economy, "the quality of our human resources is our competitive edge . . . .We have to be

much more attentive to education as well as training. . . ."[29] Creativity and intelligence require an investment in education, he warns.

> I think we're going to see a lot more training and education within institutions in order to sharpen the competitive edge in a world in which creativity and intelligence really rule the day.[30]

Several theorists believe the paradigm shifts that are washing like waves through the business world are also eroding current forms of education itself. This is consistent with futurist Alvin Toffler's theory in *The Third Wave*, in which he asserts the forces shifting society from the industrial age to an information age affect business, the military, government, educational institutions, and other social structures such as religion and the family.

Articles in the *New York Times* and other publications compare current schools to industrial age factories, mass producing students and skills in a way less and less consistent with the new world students are graduating into. Drucker believes the shift the educational system faces will be greater than the shift that occurred when the printing press made schools possible. "Many of the traditional disciplines of the schools," he believes, "are becoming obsolete."[31]

The new demands for skilled knowledge workers in the workplace will fuel a shift in education at all levels, transforming schools, universities, and the very idea of the classroom that is so familiar to generations of students. "Learning how to learn," and higher order cognitive thinking skills that help develop the imagination and creativity the

workplace demands will be a premium skill and one that a revolutionized system of education must provide if the promise of the information age is to be realized.

The "post-business knowledge society," Drucker predicts, "is a society of continuing learning."[32] However, a shifting knowledge-base has particular impact on business. "Engineers ten years out of school are already 'obsolescent' if they have not refreshed their knowledge again and again," observed Drucker. This observation also holds true for physicians, lawyers, teachers, geologists, managers, computer programmers, and a myriad of other professions.[33]

Looking to history, however, Drucker notes that difficulties in transition to new paradigms of leadership have more to do with human psychology and resistance to doing something different than to the actual newness of the ideas. Arguing that Aristotle, Cicero and Caesar knew many of the same concepts of leadership now seen as "new," such as the idea of investing in the training of subordinates, accepting blame rather than pointing fingers at subordinates, and others. Drucker believes the steps needed for corporate American to transition are obvious, but are not being done for two reasons.

First, too many current business leaders are afraid of strength in their associates and want to dominate. The role model of modern day executives, however, should be a historical one--the first man to build a large corporate type business in America, Andrew Carnegie. The epitaph on his tombstone speaks his entire management philosophy, one consistent with the transition into Drucker's knowledge society. It states simply, "Here

lies a man who knew how to bring better men into his service than he was himself."[34] "Real leaders," says Drucker, "welcome strength. They are not afraid of it."[35]

Second, the barrier to transition is simply a fear of what is different. Many managers and executives want people who are just like them. Unfortunately, notes Drucker, "only mediocrity is uniform."[36] Firms must learn to tolerate and embrace diversity and to realize the strength that lies there. "Strength," says Drucker, "is always diverse, and a challenge."[37] But reaping the rewards requires meeting the challenges. Many leaders will find it a challenge to work in an environment or organization where the workers know more than the boss. Rather than taking an expert in sales, and trying also to make him expert in marketing and research and development, businesses must build leadership teams in which experts take leadership in areas in which they excel. Even harder for business leaders, notes Drucker, will be working in situations where managers and executives must work with those over whom they have no control.

Harvard University School of Business professor Dorothy Leonard and independent business consultant Susaan Straus add some depth to discussion of diversity in the workplace. They observe that innovation--which is critical in maintaining a competitive edge now and in the future--occurs when different ideas, different perceptions, and different ways of processing and judging information collide. This process usually requires collaboration between people "who see the world in inherently different ways."[38] Leonard and Straus observe that in group decision making each participant has cognitive differ-

ences, or "varying approaches to perceiving and assimilating data, making decisions, solving problems and relating to other people."[39]

A shift to the paradigm of innovation in an information rich environment demands diversity in order to turn a mass of data into knowledge and to allow organizations to recognize opportunities and have the mental agility to seize on these opportunities. However, the great potential of diverse teams comes with additional challenges. "In a cognitively diverse environment a message sent is not necessarily a message received."[40]

To overcome these problems requires individuals in the group to understand their own thinking styles and cognitive strengths and weaknesses, as well as the styles, strengths, and weaknesses of their teammates. This again will require new and different types of training as part of the paradigm shift. Invariably, this will be outside the "comfort zone" of older managers and executives and further add to the challenge of the transition that Drucker and others believe is inevitable. Hamel observes that a diversity of skill is required both horizontally and vertically within the corporation.

> Not everyone has the same imaginative capability, not everyone has the same conceptual skills, not everybody can see equally far into the future. The challenge is that we know those skills probably do not reside disproportionately at the top. In fact, if anything, it's at the top of the organization that people are most blind. One of the challenges I find in many companies is that top management is learning slower than the world is changing.[41]

Decision-making

The overwhelming consensus on the need and importance of training and education, as well as the need to improve and expand organizational training, is matched by other business authors and theorists who recognize problems and weaknesses in the corporate decision-making process in the face of rapid change and uncertainty.

Professor of leadership at the Harvard Business School, John P. Kotter, points out that more training in the old ways of doing business is not the road to achieving synergy and effectiveness. "Lots of places look at a good manager and call him a leader. What they're growing are great managers for the 1950s and not leaders for 2010."[42] He warns that the development of leaders does not have teeth if the boss is not personally behind the program. Something as important as the development of skills critical to corporate survival should not be viewed as an activity delegated to the human resources department.

Unfortunately, despite the lip service paid to emphasis on training and the importance of decision-making, two business professors from the University of New Orleans maintain that in reality most managers are poorly trained in this critical skill. As a result, they fail to realize the common mistakes they make and the consequences of the common shortcuts they take.

> The primary duty of managers is decision-making. Regardless of the complexity of the problem, people typically use shortcuts. Research indicates that professionals are unaware of the pitfalls that can occur when using decision shortcuts."[43]

Common mistakes that affect decision makers regardless of the decision-making process they use often have to do with assumptions. Psychological pressures from both within and outside the problem-solving group may push to overemphasize or underemphasize certain factors, and assumptions are made to support these wishes. Overconfidence may also affect decisions as firms inflate the ability of their product to sell or forecast unrealistic growth rates. Tunnel vision may cause decision makers to discount or totally ignore other variables and information that does not fit the solution they favor or are trying to develop.

This process is known as framing. There are three aspects of decisions that can create a frame: (1) the boundaries selected; (2) the reference point or perspective; and (3) the measurement of success or failure.[44]

"How you 'frame' a matter, i.e., emphasizing some factors and deemphasizing others," experts recognize, "affects managerial judgments and decisions."[45] Though in the past, poor decisions may have resulted in finger-pointing and the reassignment or firing of managers, recognition of the cognitive and psychological aspects of decision-making is placing more emphasis on training and improvement of decision-making skills.

Assumptions and other pitfalls in decision-making are often part of the corporate environment and can also stem from a lack of diversity or group think by the team. "Boundaries," researchers say, "may be derived from assumptions we have made by our training or cultural background. We have a hard time identifying the boundaries because we do not question our (often automatic) assumptions."[46]

Too often, assumptions may be treated as fact. Failure to periodically reexamine assumptions can be disastrous. Using examples from the U.S. auto industry, research showed a case in which planning factors based on models developed in the 1950s for the time required to retool production lines remained in place into the 1960s and 1970s. These numbers were key to forecasts of inventory requirements and production efficiency. Japanese firms focused on reducing this number and made continual changes and improvements that resulted in getting it down as low as forty-four seconds in one plant while U.S. firms still used an assumption of six to eight hours. As a result, Japanese firms increased production efficiency and decreased costly inventory requirements and gained profitability and a competitive advantage over U.S. companies.[47]

Looking for a reference point or perspective in problem solving can be as simple as choosing to look at a glass as half empty or half full. Researchers compare the cognitive effects of framing to that of an optical illusion. "Framing effects are not verbal tricks but a perceptual illusion similar to the visual illusion created when looking at distant buildings: the closer buildings look taller than the distant ones, even if the distant ones are actually taller."[48] However, if not aware of these perceptual differences that distort variables used in decision-making, the result is still a poor or faulty decision.

In another example from the U.S. auto industry, during a period in the 1970s of growing competition from foreign manufacturers, the "Big Three" U.S. automakers continued to use competition amongst themselves for market share as a reference point. Because of the affect of framing on their decision-making, "they failed to realize that their

overall share of the market was declining because consumers were purchasing the fuel-efficient cars produced by foreign manufacturers."[49]

In looking at the measurement of success or failure, the point is illustrated by the words used to describe the outcomes and impacts of decisions. For example, most departments would prefer to be overbudget by only 10 percent as opposed to being over budget by $10,000.[50]

Managerial Cognition

The private sector recognizes the importance of the knowledge and mental processes or cognitions that participants in the decision-making process bring to the table. As firms seek innovation from their decision-making processes, they often forget that innovations are what successfully implemented decisions regarding new ideas are called. "New ideas that fail are usually called mistakes."[51]

But paradoxically, these failures may be valuable tools in learning to achieve future success. "Failure is a very important part of the learning process,"[52] says Hewlett-Packard CEO Lewis E. Platt. The learning process is not complete, and leaders and decision-makers may lack humility and a sense of their own limits if they have not experienced failure. Though exempting failures of character or repeated failure, Platt illustrated his point with the personal experience of a project that failed. It "cut me down to size," he said, "I was a lot less cocky after that."[53] From their experience with the failure of the Apple "Lisa" computer, CEO Steven Jobs and his corporate team gained the knowledge and experience necessary for their successful Macintosh line of personal computers.

Managerial cognitions refer to the mental models that people use to make sense of their world and to make decisions about what actions to take. These models vary with different individuals based on their education, training and own unique experiences. As a result, different individuals in the decision-making process may select, emphasize, deemphasize, and use different knowledge and information in different ways from other participants in the same process. "Cognitions," say decision-making researchers, "particularly those of key decision-makers" can affect decision outcomes depending on how they relate to the knowledge or information presented in the process.[54]

These human cognitions can be particularly important when technology is used to assist in decision-making. Research suggests that organizations and technology cannot operate independently of the cognitions of the people involved. Technology can either "confirm ingrained patterns" or entrench existing knowledge and cognitions (both good and bad) or serve as a platform to alter and improve on knowledge.[55]

Evidence from research indicates an even greater need for individuals involved in decision-making to understand their underlying cognitive maps or patterns as well as for those who interact with each other in this process to recognize the cognitions and thinking styles of others. There are numerous historical examples in the business world of companies whose ingrained cognitions resulted in bad decisions despite new information indicating they were headed in the wrong direction.

Classic examples include the determined efforts in the late 1800s by then communications leader Western Union to squash the growth of the embryonic Bell Telephone

through legal actions, restrictive agreements with their customers to deny access to the new technology, and other actions attempting to use their market power to limit competition. Rather than recognizing change, they resisted it and ultimately lost. Howard Johnsons is another example of a company once dominant in both position and market share in a business that exploited the technological shift and new markets created by the automobile. However, when that market continued to evolve in the 1960s and 1970s as other aspects of the environment changed in response to the technology, such as the growth of interstate highway system, shift in population to the suburbs, Howard Johnsons remained trapped in old thinking and cognitions.

Lack of flexible thinking and a tendency to frame problems in a way that skewed available information left them vulnerable to new competition from the growing and innovative fast food businesses. In a pattern similar to the U.S. auto industry's response to foreign competition, new competition was denigrated and underestimated. As Bill Gates warned, their past success was a poor teacher for the future.

Though research shows that standardization of processes makes it easier for managers to learn decision-making systems and for the outcomes of this process to become more predictable,[56] it also indicates that in a complex environment, a mixed strategy that includes several different decision-making processes is needed.[57]

A mixed strategy is more difficult to train and requires a greater investment of time and resources. But as examples show, the costs of failure can be much higher. Managers learn through observation, participation, and experience. Training managers in a system

that requires cognitive knowledge of both themselves and other participants in decision-making, as well as providing familiarity with different decision-making techniques and processes is a daunting task not well suited for traditional or industrial age teaching methods.

Teamwork

Part of successful decision-making is the interaction and personal synergy that develops between the members of a team tasked with making decisions and solving problems. Though this can lead to conflict and disagreements in a team, this disagreement can provide the creative tension needed to develop innovative solutions. As with most of the new skills required in the effective exploitation of an information intensive environment, quality training and highly skilled leadership is needed to focus the energy of a diverse group and bring it up to its potential.

In evaluating the steps to better a decision-making team, *The Harvard Business Review* notes several steps to improve team performance. First and foremost is putting together a diverse, heterogeneous team. Variation in factors such as age, genders, functional background and industry experience will also give the team a diverse outlook and perspective on the problem. In a quote very similar to George Patton's observation on thinking within a team, they observe, "If everyone in the meetings looks alike and sounds alike, then the chances are excellent that they probably think alike, too."[58]

Another step is to get team members to think outside their traditional areas of responsibility and try to see problems from the perspective of other members of the team.

Particularly in bureaucratic and hierarchical organizations, members of a team come to represent their department or discipline rather than a commitment to developing the best solution to a common problem. Seeing a problem from a different perspective can break these parochial logjams and lead to improved teamwork as well as improved decision-making.

In addition to war gaming, a key technique is for the team to put themselves in the role of the competition and think through how they would respond to friendly actions and initiatives. This can be difficult for some team members. Too often firms are so steeped in their own processes that they assume the competition thinks and acts like they do. However, using available facts and information to break out of the trap of seeing the enemy as planners think he is, rather than as he really is, can provide valuable insight into plans and perspectives.

An important goal in managing diverse teams is managing conflict. Disagreement or differing perspectives are healthy, but not if they devolve in rancorous battles between individual team members. Conversely, "don't confuse a lack of conflict with agreement," warn researchers. Particularly if one or another staff section or department is dominating the discussion or pushing an agenda, others may simply acquiesce or disengage.[59]

"Every discipline is 'guilty' of attempting to fix problems with its tools, whether they are appropriate or not."[60] For example, accountants are trained to look in terms of monetary consequences, rather than motivational or market share issues. "Many compa-

nies have addressed the disciplinary boundary issue by hiring managers from varied backgrounds to bring these different perspectives to decision-making."[61]

There are clear benefits to a diversity of ideas and thought in problem solving. However, team leaders must be trained to manage this human capital. Teams can fall into factions. The diversity of ideas can slow down the process with too much discussion or the process can be sped up to come up with any solution rather than an effective solution by ignoring facts and information that call for a more in depth solution.

Simply forming a team of diverse individuals or considering many ideas does not result in more effective decision-making, and unless the energy of the team is focused and united in a common purpose, a company is only paying lip service to teamwork and diversity. Conversely, team members more accustomed to a homogeneous environment may have difficulty adapting to a different kind of teamwork needed in a heterogeneous one. As with other aspects of decision-making, this type of knowledge and experience is not entirely suited to traditional classroom teaching. Putting new knowledge and skills into practice will require the practice of these skills. Firms which cannot afford to make mistakes in on-the-job training will need solutions which allow training time to optimize experiential learning.

Intelligence

Intelligence and information are critical components of decision-making. Like decision-making, they may often be talked about and thought to be better than they really are.

Excellent companies tend, almost by definition, to have good intelligence. It is not trotted out during a crisis, but is used and integrated into everyday operations. It is well regarded and respected within the company and permeates the organization rather than being relegated or compartmented in a single department or section. Excellent companies "work at putting intelligence techniques into practice throughout their organization, quietly and effectively."[62]

But many companies are good organizations, but fall short of excellence, and suffer due to poor, ineffective or dysfunctional use of information and intelligence. One business executive identifies some typical reasons or causes for bad intelligence.

1. Disconnected Management. All the knowledge and information for decision-making is often present within an organization, but due to causes as varied as personality conflicts, bureaucratic divisions, and departmental rivalries, companies often more resemble dysfunctional families than the well oiled machines they seek to be. "The parent may not talk to subsidiaries; the field fails to inform management or news its heard and so on. The result is shoot-from-the-hip decisions."[63]

2. Poor Ground-Level Data. The old saw in the military that "the first report is always exaggerated" applies to the business world as well. Press releases from the competition can cause panic and overreaction. A solid base of information is needed to distinguish fact from hype. But even when good information is available, it does not always get to the people who need it. For example, a competitor's announcement of a new product rollout in the next few months could lead the sales force to clamor for price cuts and in-

creased advertising to respond to a competitive threat. Poor timing of a price-cut and advertising blitz could result in loss of market share to the competitor, and as in military operations must be synchronized at the right time and place. Better ground level data on the competitor's labor force, imports of raw materials, plant locations, and machines used in production may show the product launch is more likely in twenty weeks, rather than the announced ten or twelve, allowing better timing of a response.[64]

Though in the above example, a firm is responding to an external threat, the problem with information and analysis when a firm seeks to get act rather than react and to take innovate steps is more difficult. Studies show that though as much as 60 percent of the knowledge and information required to develop innovative solutions is already in the firm. The problem is now not only analyzing and assembling this information into an innovative solution, but to acquire and remain receptive to information collected from outside the firm.[65] This requires not only having people who can collect this information but a willingness by decision makers to accept and consider information from outside the boundaries of the organization.

3. Confusing Analysis with Information. In many cases, the problem is not access to information, but how the information is analyzed and interpreted. Analysts can paralyze the decision-making system with reams of paper that talk about what the information is without addressing what the information means. Toffler notes that an important aspect of information is asking the right questions.[66] There is a clear need on the part of senior executives to focus their analysts and information systems by asking clear and

concise questions. However, once these questions are asked, analysts must likewise produce clear and concise answers, regardless of how much or how little information was needed to deliver these results.

An example of this is a management team that asked how a rival was continually underselling them. Rather than providing analysis, the team simply restated in lengthy format what was known about the competitor. In fact, the competition had a clear strategy of focusing on specific niches and accepting risk in other areas. By focusing R&D costs on its niche, it was then able to leverage these developments in other areas, reduce costs, and gain market share.[67] Simply having an information system and having analysts does not assure the system will produce good information. The system must be focused, trained, and provided feedback on what is supporting decision-making and what is not.

4. Not Understanding the Enemy. The example of competition between well-established British Airways and the new and innovative Virgin Atlantic airline illustrates valuable lessons in underestimating competition and mistaking the size of a threat for its significance and impact. As Western Union initially dismissed Bell Telephone and Howard Johnsons did McDonalds, British Airways viewed their small competitor as a minor nuisance. However, by combining marketing skills gained in the recording industry with a keen focus on the decisive human terrain of the transatlantic market--the frequent business traveler--corporate guerrilla Richard Branson of Virgin Atlantic successfully battled the much larger British Airways for market share.

Virgin Atlantic closely watched their competition to gauge their level of service to customers both in the air and on the ground. They incrementally made improvements to service to set them apart from their rival and maintained advertising to ensure customers were aware of the changes. "Television screens in coach, a masseuse in business class, sleeper seats in first class, and a dinner buffet in the business class waiting lounge" were examples of innovations and new ideas that lured customers from other airlines.[68]

It also demonstrates that though small in terms of number of planes, staff, and airline gates, they were able to leverage information about their competitors and integrate it into an effective decision-making process at the same time they were underestimated by their competitors. They translated their small size and niche focus into competitive advantage and market agility.

Critical Thinking

A path to solutions in problems in decision-making and perhaps content for the much talked about and needed training in helping firms to leverage information is through critical thinking. Educational theorist John Dewey defined critical thinking as "reflective thought," the suspension of judgment, maintenance of a healthy skepticism, and keeping an open mind.[69] These steps help provide a better basis for asking the right questions, filtering information, identifying key issues and their relationship, and developing solutions to problems. It also provides a cognitive framework for continuous learning by preparing individuals to evaluate the results of their decisions and to continue to learn from both their successes and failures.

The Watson-Glaser Critical Thinking Appraisal helps to further define critical thinking. It lists five key skills that critical thinkers must have as part of their knowledge base:

1. Drawing Inferences
2. Recognizing Assumptions
3. Drawing Conclusions
4. Interpreting Data
5. Evaluating Arguments[70]

The ability to make inferences in today's information rich environment can help firms make timely decisions with suffering the paralysis of trying to develop a 100 percent solution. If decisions are not timely, the problem itself may change in the time it takes develop a solution. Recognizing assumptions has already been identified as a major pitfall in decision-making as has interpreting data. Having a mass of data is not the same as having information. Simply learning how to search or query for data when so much information is now available is also becoming an important task by itself. Information overload can by both physical and mental. Despite technological aids to decision-making it remains a human quality depending on the learned skills involved in critical reasoning that turns data into innovation and competitive advantage in the marketplace.

Even in the rather staid and predictable field of accounting, professional organizations are recognizing the need for professionals to basically "learn how to learn" while in school to serve as a foundation skill when they enter a workplace that will require con-

tinuous learning. Critical thinking is seen as an important step to students becoming "active learners in the learning process" rather than "passive recipients of information."[71]

Though "organizations often ignore critical thinking,"[72] many businesses and business schools have also begun to take an interest in response to many of the issues already discussed above. After recognizing problems with how employees were reacting to problems on the assembly line and elsewhere in the organization, Chrysler CEO Robert Eaton agreed to make one critical thinking process--problem solving--a core competency for all workers. As a result, Chrysler's problem-solving success rate over time measurably improved.[73]

An observed barrier to critical thinking at Chrysler included lack of training. However, senior management's support, encouragement, and resourcing of training efforts were instrumental in overcoming this barrier and bringing about change. At Chrysler, this included the training of over 40,000 employees.[74]

Other barriers to critical thinking can be the perspective of the organization or educational institution trying to teach these skills. Is the problem the patient failed to respond or the doctor misdiagnosed or misprescribed? In other words, are the students or teachers at fault? Research suggests using old teaching methods to teach new skills may be part of the problem.[75]

Bored students do not think, and many institutions teach these skills in lecture classes that do not stimulate thought or captivate student interest. In time-constrained, survey type courses, a very broad content is covered without ever getting into depth in

any one area. Such superficial coverage does not stimulate thoughtfulness. Anything other than a small group of students also defeats the goal of generating discussion, thought and student involvement, though larger classes are invariably easier and cheaper to teach.

Teachers find it much easier to develop classes and provide grades for blocks of instruction that tend more towards rote memorization. It is easier to teach and grade at the lower end of Bloom's taxonomy than to tackle the more difficult and time consuming challenges of developing curriculum, teaching and grading higher-order thinking skills. Teachers and instructors pressed for time or given inadequate time for planning and preparation also do not have time to share information and exchange ideas about new and innovative teaching techniques.[76]

Like the progressive nature of Bloom's taxonomy, the road to critical thinking ability rests on previously learned skills. Research shows students need a "rich store of information" as a "precursor to the act of thoughtfulness."[77] If, as Dewey theorizes, critical thinking is "reflective thought," then there must be something there to reflect. Research suggests that teaching "a subject matter such as history is in many ways equivalent to teaching thoughtfulness."[78] From the foundation in history, students are both given a set of experiences lived and knowledge gained by others to use as a frame of reference, as well as being required to "organize, interpret and analyze such knowledge." History further "exposes students to experts who serve as models of reflectiveness."[79]

Leader Development

Business leaders have come to recognize that "developing leaders, at all levels, is a critical priority in successful organizations today. It needs to be pursued with the same zeal as new product development, new customers, and a competitive edge. Many outstanding business leaders feel it is their job to develop others, and they undertake it personally rather than delegating to others."[80]

The desire to develop leaders is not entirely altruistic, but rather a result of the changing pace of the marketplace in the information age. "The only differentiator in today's marketplace," notes a management consultant, "is the quality and speed of action. The only way to increase speed is through leaders--people who are prepared to make smart decisions and implement them efficiently at all levels."[81] Though easy to say, in discussion throughout this chapter, the multi-faceted issues of what it will take to develop these leaders have been considered.

The shift to a strategy that focuses on an investment in the human capital of managers, and a shift to the idea that managers are in fact leaders has been an evolutionary one. The different strategies can perhaps be viewed as a byproduct of the shift in the private sector from the known and familiar ways of the industrial age and the slow but inevitable shift to adjust for the information age. "The agenda for Leadership Development has shifted drastically during the past several years," notes the president of a management-consulting firm. "The 1980s was an era of radical restructuring . . . . The idea of developing leaders seemed to fade in the face of fear of the future and the pursuit of quick

fixes. The early 1990s will probably be remembered for management fads that emphasized process over leadership. Now the central challenge for Senior Executives is to create a company that wins continuously."[82]

Though academic institutions--faced with the same pressures of change confronting economic enterprises--are also making changes, corporate in-house leader development patterned after institutional education have suffered many of the same problems. "Most of the work that has been done in leadership development falls drastically short. It has been too rote, too backward looking, too theoretical, and too impersonal. It has rarely been tied to a business's immediate needs nor has it prepared leaders for the changes of the future."[83]

In looking at a training plan for junior leaders to help develop them to become senior leaders, experts look not only to a formal skills training program, but also to the addition of cross-functional training and exposures and familiarization with other departments within the organization.

A hard lesson learned by IBM was to delegate many training responsibilities to people who were not leaders in the company or, worse yet, to people who were not in the company at all! Just as George C. Marshall observes in the forward to the classic *Infantry in Battle,* IBM learned that "you can only learn the tough stuff from people who have been there."[84] As many in the private sector are learning, there is more to leadership development than a set of standardized overhead briefing slides and a canned presenta-

tion. Higher-order skills are not developed by teaching methods that focus on lower level skills. Higher-order skills are hands-on and not multiple-choice.

Management authors Mary Lercel and Lloyd Field espouse in-house leader-to-leader training, coaching, mentorship, and the use of personal and organizational experience and history as valuable tools to reinforce leadership lessons. Rather than abstract classes in theory and doctrine, this creates "an opportunity for powerful, reality based learning to take place."[85] They also discourage the more sterile or abstract third person in lessons, such as "management thinks" or "IBM plans" noting that "companies don't do things, people do."[86]

Though many corporate managers and executives know how much effort goes into starting up a new enterprise or venture, Lercel and Field warn that many forget or are unaware of how much effort goes into maintaining and sustaining the momentum over time. Investment in leaders is a key part of the overall investment in the human capital of an organization.

Learning Organization

Realizing that there is more to training than just formal education and classes, several corporations have begun to experiment with the concept of the learning organization. Rather than relegating the individual component of training and learning to a reading list or some other less than dynamic tool these corporations are making space and resources available to their employees and allowing them to "design and conduct their own ongoing learning without the intervention of a trainer or manger."[87]

The learning organization is an evolving concept that may mean different things to different people or organizations. In the face of undeniable change in global markets and structures, demographics, new technology, and the overall pace of change, corporations are seeking new methods for dealing with and adapting to change. All are coming to recognize the importance of knowledge in an organization, but are not clear on how to get and keep it. Descriptions of learning organizations include descriptions like "less hierarchical, more democratic, and focused upon skill and knowledge development."[88]

Author Peter Senge believes that some of the characteristics that help define a learning organization include a shared vision of the future the firm seeks to create, reflective capabilities similar to critical thinking that make people aware of their own assumptions--particularly the deeply ingrained ones they do not normally question--and the ability to see larger patterns, understand interdependency, and develop "systems thinking."[89]

The idea of systems thinking is the *Fifth Discipline* referred to in the book of the same name. When used in concert with his other principles as part of a learning organization it seeks to allow problem solvers to see through the complexity of a problem to its root causes and then develop and implement solutions. Senge explains that the problem in most organizations is not one of too little information, but of too much. "We need to know ways to distinguish what is most important, what variables to focus on, and which to pay less attention to--and we need ways to do this which can help groups or teams develop shared understanding."[90]

The bottom line of a learning organization resembles the description of Microsoft provided by Bill Gates. It is an organization that provides for a free and open exchange and discussion of information and ideas, that values employees and helps them to help themselves stay current in their fields, and values their ideas, creativity, and involvement in operations and decision-making. The learning organization's goal is to constantly learn from its successes and failures, avoid repeating the mistakes of the past, and maintain an adaptable approach to the future. It is the antithesis of the cartoon strip world of Scott Adam's "Dilbert," which humorously exemplifies the picture of industrial age management struggling in an information age world.

One of the techniques employed in learning organizations, or that contributes to the goals of a learning organization, is scenario planning. Bearing many similarities to war gaming, scenario planning is a method for visualizing or imagining possible futures that a company may face. By forcing the consideration of multiple possibilities, it also helps to improve decision-making by focusing on assumptions and identifying trends and uncertainties. This helps to separate assumptions into those with a higher rate of certainty from those with greater uncertainty. Clear identification of assumptions also allows them to be monitored and adjusted over time. This also helps guard against the typical flaws in decision-making of over- and under-emphasis of certain information. Involvement of a diverse planning group can also help prevent the flaws of overconfidence and tunnel vision that can plague decision makers.

Companies which use this methodology in a learning organization environment are better prepared to exploit opportunities and exercise initiative more rapidly than their competitors as the result of successful scenario planning. An example is Royal Dutch Shell, which has used this methodology since the early 1970s. "Shell has been consistently better in its oil forecasts than other major oil companies," observers one researcher.[91] In one instance their scenario planning helped them see and exploit an overcapacity in the oil tanker business and in the European petrochemical industry.

Examples of firms which did not use this process, but could have benefited from it, include the U.S. automobile industry. Their failure to identify the impact of OPEC on oil prices and hence car sales and the affect of the environment movement on pollution legislation may have been mitigated by scenario planning. These examples also illustrate the idea of thinking "outside the box." One aspect of scenario planning that separates it from war gaming is a longer-range focus and a consideration of variables that though not immediately of significance could have an impact in the future.

Another benefit of the scenario planning methodology is that it helps firms to identify three classes of knowledge: (1) things we know we know, (2) things we know we do not know, (3) things we don not know we do not know.

Though biases can affect each of these categories, Wharton School professor Paul Shoemaker warns that "the greatest havoc is caused by the third."[92] Focusing on these factors, especially on number two and three, however, can help improve informational

focus, visualization of the future, and the assimilation of available and perceived information. This focus ultimately leads to improved decision-making and postures firms to seize the initiative in flexible and uncertain situations.

Learning organizations will evolve new classrooms and other support facilities as part of the evolution to new educational techniques. An intelligence conference room at Texas Instruments may provide a gimpse of the future. Equipped with two interactive whiteboards, projector, conference center computer, hybrid workstation, server . . . the room links far-flung participants via the company's intranet."[93]

This evolution will also require new skills and techniques in a seemingly endless cycle of constant improvement. According to Texas Instruments, "interactive meetings require strong management support because some people resist changing meeting formats. In general though, they accomplish more and better-quality work than at traditional meetings."[94]

"You must give people the technology to manage information more easily, then explain why it won't really get easier," says John Peetz, chief knowledge officer at Ernst and Young. "We've arrived at the twenty-first century, and the volume of information will only grow."[95]

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CHAPTER 5

HARDWARE, SOFTWARE AND BRAINWARE

> We should be careful to get out of an experience only the wisdom that is in it--and stop there; lest we be like that cat that sits down on a hot stove-lid. She will never sit down on a hot stove-lid again--and that is well; but she will also never sit down on a cold one anymore.[1]
>
> Mark Twain *Following the Equator*

Observations from the transition of military forces to mechanization in the 1930s, our current experience at the CTCs, and the ongoing transition of the private sector to the information age in the 1990s show common problems in the process of identifying problems, developing solutions, and then executing the planned solution. The U.S. Army calls this process battle command. Observed problems fall generally into the categories of information management and the cognitive skills of identifying, collecting, analyzing, assimilating, and disseminating critical information. Problems also arise from the different personalities and thinking styles of decision makers. These problems occur for both commanders and staffs and executives and managers.

The problem is not the military decision-making process per se, as the problems appear in both business and military operations. Problems stem from the strengths and weaknesses in the cognitive skills of the individuals and teams who exercise battle command. These issues represent the long term problems of training the higher-level thinking skills necessary to achieve synthesis in battle command. They will continue to plague

brigade commanders and staffs into the twenty-first century unless action is taken to improve these skills.

Fielding new technology historically over-emphasizes hardware and software. Exploiting the power of information and achieving synergies requires more focus on the "brainware" or cognitive skills of the human resources who operate this equipment. The increasing complexity of systems fielded to the brigade level in support of battle command includes systems such as the All-Source Analysis System (ASAS), Maneuver Control System (MCS), Ground Station Modules (GSM) capable of receiving downlinks from JSTARS and UAV, as well as new systems for Field Artillery and Air Defense. Each of these will go through several upgrades and new systems for logistics and other BOS will likely be fielded by 2010. These new systems present tremendous challenges to train just the hardware and software skills. Mental agility skills may be cast aside not only because of the time consumed in hardware and software training, but because it is easier to train the lower order thinking skills necessary to master machinery than it is to train the higher order thinking skills need for mental agility.

Colonel (R) Michael Wyly is the veteran of two combat tours in Vietnam and holds the Distinguished Chair for Contemporary Military Affairs at the Marine Corps University in Quantico, Virginia. He places the conflict of hardware versus brainware in military terms as a battle between two theories, Technological Superiority Theory and Mental Agility Theory. Though acknowledging that both are important, he observes that mental agility is most important and deserves more emphasis.

Mental agility can both optimize the capabilities of friendly technological systems and also overcome the advantages of enemy systems. Vietnam, he warns, was a war in which more faith was placed in technological superiority than in mental agility. A key lesson was that "there is no technological substitute for well trained warriors." In comparison, Desert Storm was an "educated" conflict in which mental agility was the master of technology. "It was the tactics, not technology, that prevailed."[2]

The German Army that turned the technology of the internal combustion engine and mechanization into the tactics of blitzkrieg provided balance between technological superiority and mental agility with the emphasis on mental agility. Though new technology helped to achieve impressive combat effectiveness superiority of 20 to 30 percent and casualty-inflicting superiority of 3-2 in World War II over comparable American and British forces, their tactical or agility focus helped to achieve almost equal results against allied forces in the lower-tech environment of World War I.[3]

U.S. forces in World War II leveraged the brainware of its soldiers not through the institutional tools of war gaming and professional discussion used by the German Army, but rather through a different kind of experiential learning tool. The Louisiana, Carolina, and other maneuvers were live simulation and large scale war games. McNair's insistence on free-thinking OPFOR, the use of umpires to observe and collect data and enforce the rules of engagement, and the conduct of critiques following each cycle of training were key catalysts to extracting learning value from the events.

Though battle command training was not the specific objective of the maneuvers, they provided an opportunity for some of the commanders to conduct high quality training with their subordinate commanders and staffs. Patton's training with 2nd Armored Division and Krueger's work with Third Army are exemplary. A measure of the success these commanders, their staff, and their units achieved during the war can be credited to the maneuvers. At a minimum, the experiential learning provided a context for them to continue to learn and apply lessons in later battles.

But simply participating in the training does not mean lessons are learned or assimilated. Rather than trying new tactics, Fredendall stuck with his World War I experience, and repeated similar mistakes at Kasserine Pass. With a different training program during the interwar years, he might have learned more current lessons, but the interwar years were not a time of institutionalized continuous learning. Though graduating near the top of his CGSC class in 1923, it was not a current education by the time of the maneuvers. Nor, at that time, was the "Leavenworth mind" known for its creativity and innovation.

Initial U.S. strategy in Vietnam in the early 1960s prepared for a World War II or Korea style invasion across the DMZ. Old thinking prevailed on new terrain against a new enemy. There was no "Louisiana Maneuver" before that conflict, as there are not likely to be before any of our future conflicts. The pace of change is too fast, and is not likely to slow down. Though the idea of a come-as-you-are war is a valid one, brigades as

a key warfighting building block must be prepared in terms of both mental skills and equipment for the next war, and not the last one.

U.S. industry from electronics to automobiles made the same mistake of underestimating or misreading their competitors and the environment of foreign competition in the 1960s and 1970s. Economic competition occurs every day, but wars only happen from time to time. The lessons learned and solutions developed by corporate America in decision-making can expand our knowledge and experience base and add a new perspective to military experience. Just as business can and has learned from the military, their lessons learned and experience can provide insights that apply down to the brigade level.

The private sector is shifting from traditional management structures to flatter organizations that rely more on networks and less on hierarchies. By stripping away layers of supervision and information filtering, they are achieving new efficiencies. The stark contrast between the corporate headquarters of retailing giant Wal-Mart and the once dominant Sears helps illustrate the changes. Rather than the multistoried Sears Tower in Chicago, Wal-Mart is still housed in a much smaller two-story building in Bentonville, Arkansas. Much of their power and authority is distributed to individual stores and regional centers. Their leveraging of information allows many decisions to be made in the field without having to waste time going through the headquarters.

During U.S. operations in Somalia to rescue a downed helicopter, a relief column moving through the streets of Mogadishu was assisted by a Naval aircraft flying above. They were tragically delayed, however, because procedures called for communications to

be relayed through the headquarters, rather than going directly from the aircraft with eyes on the convoy to the convoy commander. As a result, the convoy was delayed in reaching the downed aircraft.

In the business world, the shift in emphasis and mindset that now sees employees as human capital rather than replaceable cogs in a business machine has led to a new focus on the form and content of training. Now recognizing the losses in terms of profits and missed opportunities that comes from compartmented departments not working together and sharing information or from false assumptions and failure to keep pace with changes in the marketplace, business is adopting a mental agility strategy of its own. Focused emphasis on leadership training, decision making, and teamwork is making headway towards creating more innovative, creative teams.

Though the Army excels in leadership, teamwork, and decision-making, units in the past and present suffer many of the same decision-making deficiencies as the private sector. False assumptions or ones which change and are not reevaluated, improper framing of problems, and failure to effectively task, collect, or analyze data and turn it into useful and timely information have affected operations from the Louisiana Maneuvers right up to the most recent AWE. One observer to the AWE reported "sometimes commanders suffer from inadequate training, education, experience, or intuition. They are not sure what to do, and they have an insufficient intuitive base from which to visualize the battle."[4] Both the Army and the business world benefit from the shared search for new solutions to old and recurring problems.

Business emphasis on critical thinking, a recognition of the role of individual cognitions and thinking styles in decision-making, and the process of turning data into information as well as seeking to develop a learning organization are new, innovative and deliberate efforts to overcome longstanding problems. Business is changing the way it does business rather than hoping that doing more of the same or reshuffling the organization will fix these problems. They are actively seeking to keep knowledge and skills sharp and relevant. By challenging workers in any field to stay current, shed old thinking, and learn new skills the individuals help the organization to stay sharp and guard against stagnation. One studied observer of the information age reports that to create and sustain excellence in the information age, "quality people may be as important as quality units."[5]

But the tendency for individuals and organizations to allow skills to stagnate or not to adapt skills to new environments is not unique to any period of history or to either the military or private sector. Private industry today realizes that a shift to continuous learning and learning organizations is part of the transition to the information age. Awareness of this trend and application of corrective measures benefits not only battle command, but other forms of learning and instruction at the brigade level.

In the absence of effective continuing education, the wartime experience of officers like Fredendall, Lear and Drum stagnated. Marshall, Patton, Guderian, Rommel, Krueger, and others, however, maintained a continuous education through individual study. Though individual study is key to the development of the mental skills of a warrior, individual study is only one means of developing the knowledge base necessary for military

aptitude. Networked resources, multi-media support tools and internet-like access can energize individual study.

Part of the program of institutional excellence developed for the Prussian Army that incorporated war gaming also included professional discussion groups.[6] Patton and Eisenhower formed their own discussion group while stationed together and helped each other stay abreast of the technological changes and growing threats developing during the interwar years. Professional stimulation was one means Eisenhower used to overcome his lack of combat experience. Eisenhower is the example of an officer who trained and prepared mentally for the new challenges of the next war, rather than learning and honing the skills needed to refight and improve on the last one.

Officers like Patton and Rommel used these techniques to transition their skills from World War I and adapt them to new technology. Rommel, for example, did not attempt to recreate the daring dismounted infantry charges that won him fame in World War I. Rather, he synthesized these lessons and applied them as daring armor raids that kept the larger British 8th Army at bay for two years in North Africa.

The pace of change in tactics, technology and threats moves much faster now than then, and brigade battle command will require continuous access to current information and intelligence, as well as a program to allow teams and individuals to teach, learn and assimilate new information and knowledge.

A shift from hardware and software or equipment and keyboard training at the brigade level to a balanced approach that includes increased training and development of

commanders and staffs is needed to allow this echelon to exploit technology with the agility currently envisioned. The cost of improved tactics to match our technology is an investment in the brainware of the men and women behind the machines.

History shows the debate, change and resistance to change generated by the introduction of new technology and new ideas in the 1930s and early 1940s. The problem brigades will face in future battle command, however, is not new equipment but the training, education and experience to exercise the higher order thinking skills necessary for battle command. Shortages in brainware cannot be simulated the way shortages in hardware were in the Louisiana Maneuvers of 1940.

Hardware and software skills are perishable and atrophy without constant reinforcement. This could leave little or no time to train the more complex skills of actually employing equipment tactically. The fact that a new software drop can sometimes be as complicated as fielding a new weapons system only adds to the complexity. Both the U.S. and German Armies recognized in the 1930s that new technology demanded highly trained and skilled professionals to exploit the potential of new equipment. Early work with Force XXI shows the same need. This need will only grow more acute in 2010.

TOC of the Future?

Future brigade battle command will not be a bloodless, push button conflict of robots or machines against machines. Nor will it be any easier than it was in the past. Many still suffer from the downfall of the Soviet Union in their tactical mindset. Like 1930s cavalrymen not prepared to accept tanks, they are not prepared to move out of

their comfort zone of a known enemy with defined tactics, organizations, and equipment prepared to fight on familiar battlefields. Though that world is not completely gone, the challenge of brigade battle command grows far more complex as employment scenarios now include terrain, enemy, and missions across a broader spectrum of conflict. The glare of CNN and the media can reach down to brigade level and provide a new dimension to the battlefield that further increases the complexity of battle command. Future battle command will include far more options and variables than cold war conflict.

The TOC of the future will continue to grow in digital and high technology systems, placing demands on both technical and mental agility. Computer screens and large screen flat panel displays will replace most maps and overlays, but only when these systems demonstrate improved reliability and user friendliness over current systems. Digital terrain programs and perhaps even virtual reality glasses will allow commanders and staff to view the terrain in three dimensions, rather than our current flat maps. This improved visualization can serve as a valuable tool to better battlefield visualization by commanders, staffs and individual analysts of all branches. Maps will coexist for some time with computers, just as radio did not replace the telephone for many years, and point to point voice still lives on in a phone-like UHF MSE system. Current technology allows the transmission of video and voice over digital channels. Radios themselves may be replaced or at least integrated into next generation digital systems.

Collaborative tools that allow two people at different locations to view and draw on a set of common digital graphics also exist today. Future systems may expand the

opportunity for "virtual" or "electronic" staff work. Warning orders may be received by all members of the staff at once, rather than just the commander and S3. Each staff member may view a computer screen or large screen display with real time audio and video of the briefer from Division, as copies of digital graphics are simultaneously downloaded. A brigade performing a mission for Corps could likewise receive information directly from Corps--or anyone else linked via the same digital network with these capabilities.

But, as George Marshall changed paradigms by using the telephone to speed up dissemination of orders in World War I, how far can this go? What effect will allowing battalion commanders and staffs to listen in on division orders have? Will it enhance or confuse the process? What if the Division or even Corps commander and key staff members can now watch Brigade back-briefs or rehearsals? Again, war games and simulation may help commanders and staffs to reengineer the TOC of the future, given new and expanded capabilities. Weighting the main effort may include the allocation of brainware from the higher headquarters to work with the subordinate staff as they develop their orders and go through their decision-making process.

The communications of battle command could grow exponentially with the added capability of video and voice that could become part of the TOC of 2010. But whether this capability leads to improved assimilation of information or micromanagement will depend on the people involved in the process. Decisions will be required, and what is good for some missions may not be good for other. The allocation of digital bandwidth--the measure of how much digital communications capacity a unit has--will become a new

resource to assign to the main effort brigade. Units may need to learn how to operate in high and low bandwidth conditions.

As the value of radio demonstrated in the Louisiana Maneuvers led many commanders to realize they needed more of this device, continued experience with digital systems and resources will result in the same realization. Continued trends in miniaturization and the increase in chip speeds and storage capacity will provide information systems for smaller and lighter units as well as for heavy and mechanized forces. Access to satellite imagery, terrain and weather products will assist in better visualization of the physical environment and intelligence feeds will provide better resolution of some, but not all, enemy forces. But the projection into the future or true visualization of the battlefield over time will still require the skill and imagination of individual commanders and staff officers. The battle command dynamic of conceptualization remains a distinctly human function.

Information systems in the TOC will be networked, allowing staff officers to pass products and information both within the TOC and to higher, lower and adjacent units with relative ease. But, as Henry Ford once said, does our ability to do something necessarily mean we should? Will the ability of commanders and staffs to assimilate changes keep up with our ability to rapidly change plans on-the-fly? What if an adjacent unit suddenly changes their plan? Such technology would have enhanced the ability of Third Army to do what it actually did in the Battle of the Bulge without high tech systems in 1944, but it might also have allowed II Corps to create an unwanted asymmetric gap in the allied lines at Kasserine Pass, and led to more disastrous consequences. War games

and simulation will allow commanders and staffs to train to deal with these possibilities, but only if those planning the exercises introduce these types of scenarios into the training plan.

In theory the information age is supposed to reduce paperwork and by providing shared access to information and reducing the need for management layers that simply collect and pass on data. Tasks such as tracking where friendly units are, posting maps with locations of enemy units, reproducing graphics and overlays, and similar tasks may be reduced or go away in a future digital TOC. Systems using GPS-based locations may electronically update the TOC on unit and individual vehicle locations without the need for constant voice traffic. Similar monitoring systems could potentially provide reports on fuel and ammunition on-hand, or whether a vehicle is damaged, further reducing recurring reports and radio traffic. Rather than performing of necessity the more mundane tasks of operations and simply collecting, reporting, and distributing information the TOC can become more focused on managing and mastering information and actually doing something with it.

In functionality, the TOC of 2010 will hopefully resemble less the industrial age management node to whom subordinates report statuses, which in turn is reported to higher, and orders are received which in turn are sent lower to an information age model resembling a NASA-like mission control or the technology-heavy Command Information Center (CIC) of a U.S. Navy warship. The movie and real-life events of *Apollo XIII* provide a sample scenario in which the brainware of a TOC could be used to weight the bat-

tlefield for a main effort battalion and work to develop solutions not just in the framework of lengthy operations orders, but to solve problems and execute a decision-making process as problems occur. As ground-based engineers worked technical solutions for the distant spacecraft, an electronically-linked TOC could work tactical solutions for subordinate units less able to plan while racing to seize key or decisive terrain.

As with civilian organizations that have seen a flattening of hierarchies and reductions in personnel, the TOC of 2010 may have less people than today. Certain functions, such as vehicle drivers and guards, cannot be replaced by technology, however. Some functions will be reengineered. Soldiers who serve as clerks and RTOs may become keyboard operators and analysts. Operating digital equipment will become a common task for officers, NCOs, and enlisted alike.

Technology is little more than a new tool or a sharper pencil to assist in the mental challenges of battle command. Mental challenges and stress have always existed, but by increasing the precision, speed range, and lethality it places greater demands on the brigade commander and staff. Whether data is displayed on a sand table, map, or computer screen does not relieve commanders and staffs of the burden of thought, judgment, analysis, and decisions. Their knowledge, skill, and teamwork, not their machines, will determine success or failure. The mental agility and cognitive skills of the brigade commander and staff collectively as a team is the key to exploiting the power of information.

Future Threat Environment

Future battle command must contend with not only the continuously changing nature of technology, but the constant flow of information about new and potential threats and contingencies. Ideally, this information will flow as content across our information systems and be supported by the national and joint organizations, school houses, and higher headquarters that generate relevant information. Repeated training against a cold war threat, or even surrogates patterned after cold war threats on the plains of Europe, must be replaced by familiarity across a growing spectrum of conflict, from the deserts of the Middle-East to South and Central America, Africa, and Southeast Asia.

The world is filled with future challenges that may affect the interests of the United States and call for the use of military force in either war or operations other than war. Perhaps the most powerful trend is demography. Analysts predict "the world population will balloon to nearly ten billion people over the next few decades, with most of that increase coming in lesser developed countries."[7] Much of this increase will be in the urban areas of the world.

Demographics argue for more urban conflicts and light warfare. Population pressures themselves may be source of tension or conflict, as was seen with U.S. policy in Haiti. Mass migrations of populations may upset balances of power and inflame religious, ethnic, and socioeconomic tensions. Narcotics fuel criminal regimes and cartels and destabilize not only drug growing nations in the Asia, South and Central America, but at transit points and national borders as well.

Geographically the most likely potential peer or near-peer threats remain Russia and China. Economic problems or other perceived threats could lead to electoral victories for ultra-nationalist parties in Russia and bring rearmament. Recent elections in India and the resumption of nuclear testing show how quickly potential threats can emerge. Chinese military leaders believe U.S. military power is over reliant on vulnerable high technology and that the U.S. is a superpower in decline. Though there is no threat of conflict with the Chinese even out to 2010, they believe readily available technology can be leveraged to defeat U.S. systems. A Chinese engineer observed, "the Chinese military could adopt methods that were like a Chinese kick boxer with a knowledge of vital body points who can bring an opponent to his knees with a minimum of movement."[8] This thinking clearly espouses a focus on mental agility, one not out of step with the military theories of Sun Tzu that may serve as a theoretical basis for an information age Chinese Army.

China is not the only threat with access to much of the same off-the-shelf technology available to the U.S. The threats of technology transfer and proliferation that can embolden potential threats and change regional balances of power will become harder to control in the future. Increases in chip and computing power may allow the purchase of $100 chips in year 2000 with same power as multi-million dollar supercomputers of the early 1990s[9] may benefit both friend and foe alike. As with armor technology in the 1930s, mental agility coupled with technology may well determine who gains the greatest advantage. Referring to the ability of the North Vietnamese to combat a high tech U.S.

Army, one analyst noted that "even technologically backward societies have a nasty habit of devising strategies to offset [America's] high-tech superiority."[10]

Other dangers that could involve U.S. interests include the volatility of relations between India, Pakistan, and China. Any clash between nuclear powers would affect U.S. interests, and this region now has three. The rancorous nature of conflict between India and Pakistan only adds to the tensions. Nuclear proliferation too may increase in the future.

Though Middle East oil has been a traditional U.S. interest and source of regional conflict, competition for a different resource may spur next century's conflicts. Turkey's control of the headwaters of the Tigris and Euphrates Rivers could result in water wars between NATO ally Turkey, Syria and Iraq. Egypt and Ethiopia could go to war over Nile River water.[11] Not only water, but arable farmland could be a source of conflict. Brazil is a nation with high technologic capabilities that faces population and farmland pressures that will only grow over the next several decades. Sudan, though lacking the same high technology base, is another regional power with population pressures and persistent drought.

Though Iraq remains a threat, the aspirations of wider hegemony by Iran, as well as support and alliances with fundamentalist governments in Sudan, Afghanistan and possible designs on Islamic republics of former Soviet Union, also threatens future conflict.

Operations in nations with existing infrastructure to support U.S. operations or an established U.S. presence may be less likely in the future. Operations as in Panama and

Saudi Arabia may not be typical. Somalia and Rwanda with little or no infrastructure and unfamiliar enemies and terrain become more likely. These threats also have fewer systems susceptible to high tech collection systems and information warfare.

The idea that we must have detailed information about a specific threat is a cold war paradigm that inhibits mental agility and change. After fifty years of cold war conflict, we had detailed information and were able to train that way. However, we have entered other conflicts with far less intelligence about our enemy. Future conflicts are more likely to have general information about a threat, with more detailed information developing as the contingency unfolds.

Until the call comes, firemen do not know if the next call will be to a brush fire or a fully engaged multistory building, whether dangerous chemicals are involved, or whether there are people trapped inside who must be rescued. They train in many skills, and apply them to each unique situation based on training and experience. This is perhaps a better paradigm for the future.

The current strategy of force projection versus forward based is likely to remain into the future. The potential threats in the post-soviet era are more varied and diverse. The current prepositioning of brigade sets of equipment around the world reinforces both the fireman analogy and The Army's ability to respond in many places to differing levels of threat and intensity. Colonel Douglas MacGregor's analysis in his book *Breaking the Phalanx* that the brigade takes on more importance as a key combat element places the need for greater responsibility for mental agility in these varied situations at that level..

Warfare or operations in urban environments anywhere in the world must be incorporated into our repertoire of battle command for both heavy and light brigades. High tech weapons are less effective in urban areas, a lesson not lost on potential enemies.

Technology itself is one of our new threats. Computer security is a new Achilles heel in information systems, just as Guderian and the Germans learned in World War I that electronic warfare was the dark side of the miracle of radio. Remembering the mental agility in the Chinese kick boxer analogy, systems can be attacked or are vulnerable at multiple weak points, including the power sources, wires and airwaves over which digital information is broadcast, and the brainware behind the black boxes. Emerging reliance on civilian off-the-shelf components, though speeding the acquisition of new technology, also poses security risks. An observer of the 1997 AWE lamented that several senior-ranking officers thought that "because fiber optic cable is becoming so common, we could just use existing civilian systems . . ." for military operations. An Army master sergeant later explained how easily and quickly an enemy could destroy the entire system, "rendering all C2 and intel systems useless," adding that, "Civilian fiber optic systems are not designed to survive wartime sabotage!"[12] Though training and education can reduce vulnerability to these threats, these problems will not go away for future forces.

And with reduced costs of high-tech equipment and systems everyone from terrorists and organized crime to the news and entertainment media have access to systems that can challenge operational and informational security. Though many news stories talk of the success and failures of amateur hackers, the real story is in the unreported suc-

cesses and victories won by hackers against private businesses and corporations. It is widely known in the information security field that successful attacks against business are often not reported. Corporations would rather absorb the cost of the loss rather than risk the adverse publicity and loss of public confidence that comes with admitting a successful attack. Computer hackers will still exist in the future, perhaps as a new branch of technical experts in a threat military or terrorist force.

Problems and Issues

The greatest problem facing brigades in transitioning over the next decade to a system that trains mental agility to leverage technology in battle command is time. There is no more time available in day-to-day peacetime garrison operations to add a new curriculum of critical thinking, professional discussion and war gaming in addition to existing requirements for maintenance, gunnery, personnel actions, physical training, and maneuver training.

The promise of the information age to reduce paperwork, though more and more realized in the private sector, has yet to impact everyday Army operations. Personnel information which could be efficiently combined to allow automated generation of many reports from a relational database still resides in separate and incompatible databases. Information which could be passed and updated on-line is instead collected via sneaker-net, or the manual exchange of computer disks. Logistics data also passes through multiple incompatible, stovepiped data systems. Many older legacy systems still employ 1970s or 1980s technology and await modernization. Even in the training base,

instructors and students often struggle with desktop systems unable to run the latest software or accept new peripherals. Though beyond the scope of this study, a commitment to use information age technology to reduce paperwork and workload to increase the available time at the unit level is essential.

Renovating the industrial age style bureaucratic reporting requirements is also needed. The Unit Status Report (USR) is a key example. Many new systems are not reported, and therefore do not receive emphasis for repair. The report itself is time consuming and unnecessarily detracts from time the staff might otherwise have for training. If information from the unit DA Form 2406, or daily maintenance status, were input into a networked database, this information could be instantly available at a variety of echelons, as well as analyzed in a variety of ways to help units solve problems rather than burdening them with a reporting requirement. This system itself represents an older way of thinking, and reinforces the fact that having information systems and data is no guarantee they will result in efficiency, synergy, or tactical advantage.

Business giant Wal-Mart gained market share, increased profit margins, and created new efficiencies by using information from the point of sale in the store to link manufacturers and distribution centers to allow just-in-time inventories. By gathering information on a nightly basis, rather than weekly or even monthly as was the case in other retail businesses, they could send smaller more focused shipments to stores, allowing stores to reduce the overall inventory of any one item and increase the total number of items a store was able to stock. These just-in-time inventories that leverage information

for multiple purposes created synergies that improved efficiency, effectiveness, and corporate profitability shifted information flow from hierarchical stovepipes to an interactive network. It stands in stark contrast to the time-consuming and stovepiped USR.

Lieutenant General Douglas D. Buchholz, Office of the Joint Chiefs of Staff acknowledges that "the Army is in need of procedural and organizational changes."[13] The potential exists to translate Wal-Mart's just-in-time inventories into military applications that provide just-in-time intelligence, logistics, or engagement areas. But it will require innovative developers to articulate the requirements for such a system. Learning from Wal-Mart is a step in the right direction.

Randy Mott, senior vice president and CIO of Wal-Mart, is the philosopher-king of retail information systems. "Retail is detail" is one of his adages; "average information leads to an average business"[14] is another. Wal-Mart's overwhelming success rests upon its famous information systems. The ability to provide timely, detailed data to Wal-Mart's buyers, merchandisers, and strategic-decision makers is integral to its success."[15] Tactical commanders at the razor's edge of a force projection conflict are other consumers who crave above-average, timely, detailed data.

The store of information linking the tactical, strategic, and operational levels of business at Wal-Mart and other businesses is known as a data warehouse. In a problem that may plague the military more than the private sector, businesses realized that despite large investments in hardware, software, and networks for operational systems, much of the information that key decision makers needed was either inaccessible or useless. A

data warehouse is a collection of all types of data in support of the decision-making process at all levels of an enterprise. This data may come from many sources in an organization or from external sources. It can include all types of data--text, image, spatial, video and audio.

Though using hardware from several different vendors, Wal-Mart has a large stake in the Teradata Database System from NCR. "Wal-Mart is to data warehousing what the Chicago Bulls are to basketball"[16] and in February 1997 announced with NCR it would triple its 7.5-terrabyte data warehouse to a twenty-four-terrabyte one, the world's largest. In 1995, the world's largest data warehouse was four terrabytes. Other large consumers of data warehouses are the banking and commercial credit industries.

Another step that could save time in units and help force more efficiency in Army training systems would be creation of a data warehouse for training information. A wealth of training material in the Army is currently spread amongst our branch schoolhouses and other training agencies and facilities. But most is inaccessible in analog format or restricted to the disks and hard drives of individual instructors and departments. Though some information is now coming available on the internet, it is a hit or miss proposition. Brigades in the next century will still have to teach and train a variety of non-battle command related tasks as well. The ability to access training materials from a data warehouse of training materials will save time at the unit level, as well as serving as a medium for discussion and data exchange between the broader Army training community.

Where staffing and discussion of new doctrine is often limited in a paper-based or hierarchically oriented staffing procedure, use of a data warehouse with two-way communications with the field could open and invigorate the process of developing new doctrine and training by creating and involving a wider pool of expertise. This might help emerging doctrine and training to stay current and maintain relevance in the pace of information age change. Brigades and other units will benefit from the products created by such a system. Though faster and more efficient, it is no different than the liaisons that Leslie McNair sent forward to the warfighting theaters in World War II to gather data to keep his training system current with the latest data from the field.

Demographics affect the future not only in terms of threat, but from a recruiting standpoint that could impact future battle command. Though the last several years have provided a sufficient base of high school graduates to allow a smarter force, competition from the private sector for the shrinking pool of high school and college graduates may present problems in the future. The private sector clearly recognizes the value of their skills and education. Complaining that the Army spends billions of dollars on systems and then pays operators $25,000, Lieutenant Colonel (R) Ralph Peters illustrates that maybe the military does not.[17] Many highly-skilled soldiers leave the service for higher paying contractor jobs in the private sector.

Another hurdle will be the mental shift from treating information management and computers as something that the signal officer or someone else is responsible for to realizing that they are key common tasks of the information age. As in business, many older

officers and NCOs will be resistant to this. But fortunately, not all are, and some are leading the way, as Heinz Guderian once did for the German Army. Lieutenant General Buchholz recognizes that "network management is the key to information technology."[18] He points to Wal-Mart and how the retailer focuses on computer networks to manage and distribute information. Their strategic focus and niche for use of their networks is in inventory control.

Admiral Joseph J. Dantone, Director of National Imaging and Mapping Agency (NIMA), proposes a strategy for his agency that "will lead to systems that provide information rather than just deliver products."[19] But these two standout leaders surely have their critics. Changing minds is no easier now than it was in the past, leading one senior USAF general to remark, "you'd better get captains and majors to play, because the generals and colonels just can't get it."[20] Those captains and majors are the leaders of the Army in 2010, and if they are not exposed to new training, new ideas and become acquainted with the potential problems of the future, the implementation of possible but not planned change could take even longer.

It is never too late to start the sharing of information, and to emphasize that and information system and mental agility is not dependent on computers and technology. John R. Messier, President of GTE Federal Systems warns "We know too much and understand too little . . . . We absolutely must share data to make sure it is accurately understood."[21]

Another issue or risk is that we become overly optimistic in our projections of future capabilities and oversell our systems to ourselves and to our junior leaders. The very phenomena of "framing" that affects our ability to effectively execute our decision-making process can also affect our ability to effectively implement technology in the future. Two observers of this process warn that we will create a skewed picture of future if we "fall prey to optimistic assumptions of dominant battlefield knowledge and a compliant adversary."[22] The same observers warn of a need for humility that reemphasizes the necessity of focusing on mental agility rather than technological superiority, noting that "information dominance is not a killing element - it is an enabler only."[23]

Information Management

The observation of the Commander, Operations Group (COG) at the NTC following the 1997 AWE summarizes the observations of deficiencies in information management from World War II to present in both the military and civilian world, and defines the challenges for future battle command. "We must be careful to dominate information," he said, "otherwise it dominates us."[24]

In this exercise staff officers, particularly the intelligence officers (S2), were overwhelmed with information. "Unfocused intelligence collection and trying to be too precise caused delays in decision-making..."[25] Clearly, mental agility cannot be delegated to a single staff section. It is a team effort. Vague command or operational guidance can result in unfocused intelligence, as can failure to coordinate between staff sections. A typical problem seen in CTC rotations are units that fail to update or revise their PIR. The PIR

as part of the Commander's Critical Information Requirements (CCIR) are a critical component of information management in the TOC and helps maintain a focus. Units become inwardly focused, and even in today's less information-intensive environment, forget that other units who can support them from a distance need these questions and priorities to help them. In a future TOC, with many sources of external support, the need to keep external sources focused and in touch with our priorities is even more important.

Doing something is not the same as doing the right thing, and staffs that are weak on the cognitive skills necessary to turn data into useable knowledge (I hesitate to use the word intelligence, for in the current paradigm, this is almost automatically assumed to mean the S2. It does not.) resort to other less productive tasks. In the AWE "staffs tried to pass information to everyone . . ."[26]

Without the necessary focus on what is needed, what is not needed, and to what level of detail it is needed, staffs will work very hard, but ineffectively, to try to come up with the best answer. Staffs during the AWE worked to develop the "perfect" picture, when less detail provided faster may have been enough. This is not meant to disparage the work of the AWE, for this is extremely valuable training, but the lessons learned there help emphasize the work that needs to be done in transitioning to a system and focus that will produce the mix of skills needed for twenty-first century battle command.

In the future brigade TOC, commanders and staffs may either be overwhelmed with information, or able to generate clarity from chaos based on how they query databases, what information they request, what questions they ask, and how they prioritize

"critical" information requirements. Though the CCIR are part of current doctrine, many staffs lack experience in developing effective ones. The growing number of systems accessing data in a brigade TOC increases the importance of the cognitive skills needed in developing effective information priorities.

Perhaps the key task for the information age in both business and military operations is summed up by Colonel James J. Grazioplene as "Staffs must strive to provide only minimal essential information at the right time to the right people for action/decisions."[27] This cuts to the heart of mental ability. It is easy to say, but hard to do and requires training and more importantly practice and experience. How is the staff to know what the minimal essential information is? When is the right time and who are the right people? The current decision support template is a doctrinal product that seeks to answer these questions, but as observed in both BCTP and at the CTCs often lacks detail or is not done at all. The visualization of the battlefield developed by the commander and staff provide many of the answers, but again, this cognitive skill and the imagination it requires is also not consistently demonstrated in training exercises.

Periodic schooling every few years will helps, but does not keep pace with rapidly changing doctrine and technology, nor does it address the perishability of unpracticed skills. In this case, technological skills may be more perishable than mental agility skills. It is not certain that future systems will have better human engineering than today's. Forgetting how to perform a task on a digital system, or performing it incorrectly could have the same result as a failure in mental agility. If doctrinal and materiel developers are

focused too far into the future, they may miss valuable lessons being learned today. The ADC(S) of the 4th ID recently complained that doctrinal developers are so busy working on Force XXI, they do not have time to help him with the force he's training today to get there.

The demands of continuous learning in an environment where doctrine changes every few years demands training where the target audience, practitioners of battle command, will spend most of their time--at the unit . The pace of change is currently faster than centralized training bases and facilities can keep up with. We should go back to the future and capture the techniques we used to gather and disseminate lessons learned in combat to other units in theater and to units in the training base. The decentralizing trend of the information age must apply to education, facilities and resources as well.

The Army will continue to follow the same trend as industry of pushing more and more information to lower levels to leverage technology and increase capabilities. The press of technology will continue to place more and more responsibility on commanders and staffs at lower and lower levels in the planning and execution of battle command. The point is illustrated by the ADC (S) of the high tech test bed 4th Infantry Division (M) who observed, "Digitization increases workload on soldiers. Because the soldier has to train harder, he has to work harder."[28]

These people and not the technology itself will determine whether or not technology lives up to its potential. Reflecting on lessons learned in Operation Desert Storm,

two U.S. Air Force officers observed that "the critical factor that leads to success in technology exploitation remains the human element."[29]

Former Army Chief of Staff Gordon R. Sullivan illustrates the importance of the human factor in exploiting the potential of technology with the historic Battle of Crecy. Though the longbow was credited with winning the battle, it was actually the innovative tactics developed by the English that led to victory. The longbow was around for 200 years before human ingenuity leveraged the technology with decisive effect.[30] Even the longbow was complex technology for its time, and skillful employment required regular practice. It would be foolish to believe that more complex technology, though weighted more to mental than physical skills, would need less and not more training.

Future battle command will be more mentally challenging and provide less margin for error. The potential environments where we may operate and the potential threats and contingencies will be more varied than the European Cold War scenario, or even an Iraqi middle eastern one. Information provided in greater quantities by information system must be assimilated with increasing speed. Decisions will have to be made both faster and better. Calls for initiative, calculated risks and exploitation of opportunities sound good but are hard to do. A significant risk is that--as in our own Civil War or in Vietnam--the power of technology that can bring distant expertise to the commander's fingertips can also bring unwanted help in the form of micromanagement from ever more distant observers.

Lloyd Fredendall's micromanagement of the II Corps battle against Rommel from his distant command post undercut the authority of the division commander closest to the battle. This was one of several factors that contributed to the defeat of American arms at Kasserine Pass. Personality conflicts between these two officers also contributed to the breakdown in battle command. General George C. Marshall's observation from over fifty years ago is just as apt today as it was when he first said it "Warfare today . . . is not a game for the unimaginative plodder."

But Fredendall was a product of the system that trained him in the same respect that the business school graduates and executives who led the U.S. automobile industry into decline by underestimating foreign competitors and overestimating their own power were products of theirs. Though it is easy to point the finger of blame at Fredendall, his failure was perhaps symptomatic of a training system that did not provide continuous learning and allowed his skills to stagnate. A large growing army, with skills that can be trained in relatively short periods can afford not to develop human resources and replace them when needed. Smaller high tech forces with skills requiring lengthy training, however, must make a greater investment in their high tech warriors and need to preserve them, rather than allowing their skills to atrophy.

Battle command of the future will be awash in a new intensity of information. Raw data mixed with information and intelligence, images, pictures and sound. Whether all this is assimilated as information overload or a coherent picture of the battlefield will depend on how much training and experience commanders, staffs and operators have in

operating in an information intensive environment, whether their skill in the mechanical tasks of operating the equipment and the human engineering of the equipment enhances or detracts from the cognitive tasks of assimilating information, and whether they intuitively understand and accept the implications of increased speed, lethality, and visibility.

There is only a certain amount of genius in any endeavor that is naturally occurring. We seek to develop organizations that have the mental agility of a Patton or a Rommel. Based on lessons from World War II, the present day and observations of modern corporations, it appears we can build teams that have the diversity of thought these individuals had and come near to achieving the results they and the teams they trained were able to accomplish.

Training

The skills required for effective battle command in this or any age are developed incrementally. A level of proficiency is required at the lower levels before students can master the higher order ones. They require a long term commitment to continuous learning. Brigades will need improvements, renovation or replacement of existing classroom facilities to support continuous learning. They will need external support in developing the curriculum and content necessary to sustain continuous learning at the brigade level.

Higher order thinking and learning are not well adapted to the traditional classroom environment of thirty chairs all in rows and a lecturer on the platform. They are best adapted to smaller groups, interesting and innovative presentation methods, dialogue and discussion. Smaller groups mean more instructors and trainers, and better training for

those charged with training end educating these skills. Industrial age facilities and class-rooms are ill suited for effective training of information age skills.

The leaders with the most experience and the greatest ability to teach these skills will naturally be the more senior leaders. Patton and Krueger, and certainly others, were very directly and personally involved in training their staffs. Even Drum, though more studied in World War I tactics, trained his staff and fought a credible battle against the more innovative, but less experienced, Griswold in the Carolina Maneuvers. Peter Drucker's CEO friend who feels his only job is to train his up and coming subordinates further indicates that a key resource in training future battle command is not just class-rooms and funding, but the personal time of the commander.

As Guderian and others have noted, teaching is demanding work, particularly when teaching bright inquisitive students. An added benefit of greater direct and personal commander involvement in staff training and other instruction that supports the cognitive skills of battle command is that the commander too would benefit from the intellectual exchange. Ideally, the experience would resemble the biblical allegory of iron sharpening iron. Even so, there are risks. The German system that generated mental agility in the late 1800s flirted with group think and stagnation during World War I. As characteristic of a learning organization, however, the Army was able to learn from its mistakes and ad-just tactics and techniques during the war, but not with enough innovation or imagination to win it.

The higher order skills go beyond simple memorization, though much information needs to be memorized to allow cognitive application of battle command. Creativity, innovation and imagination in battle command is not developed sitting in class. These skills are developed as a byproduct of other instruction. For many leaders of the past, combat experience provided this other instruction. But as the German military theorist Balck noted, a rigorous study of history can help fill the gaps left by lack of combat experience. To be applicable to training at the brigade level though, this study must be what Patton calls a study of military history in its "crudest form."[31]

Though the example of Crecy as an illustration of mental agility over technological superiority is a useful one, a more tactical focus or "cruder" view of the history might discuss how rains changed the nature of the terrain and encouraged the French horsemen to stay more to the roads. The English bowmen occupied slightly higher ground, and the rolling nature of the terrain with a rise to either side of the local roads formed a natural engagement area into which the French rode repeatedly. The massed fires of the longbows--the tactic which leveraged the technology of the longbow--made this ever a more deadly killing ground. The use of obstacles to channelize the movement of the French horsemen enhanced the positions and further contributed to the victory.

The integration of digital terrain or even commercially available satellite imagery could add a more visual and graphic nature to the historical review of the battle. Technology could be leveraged to help young leaders better visualize both modern and ancient battles to develop the mental database of experiences needed to synthesize the simpler

lessons of battle command and develop cognitive skills. Patton reveals this as one of the keys to his success, explaining that "in order for a man to become a great soldier . . . it is necessary for him to be so thoroughly conversant with all sorts of military possibilities that when ever an occasion arises he has at hand without effort on his part a parallel."[32] He alludes to the cognitive side of this study by explaining that a student must follow military history down "in natural sequence permitting his mind to grow with his subject until he can grasp with out effort the most abstruse question of the science of war because he is already permeated with all its elements."[33]

Though the repeated French assaults against the English positions at Crecy may not be the best example, commanders and staffs, in studying the poor decisions and inflexible plans unsuccessfully executed by past commanders and staffs might learn to see the inflexibility and flaws in their own plans. Guderian's exclusive use of German defeats as teaching tools while he was an instructor may well have served to guard against reinforcing the negative lessons of success that Bill Gates warns against.

War games are another valuable method for passing on experience and adding to the lessons of history. Current technology will allow, provided the requirements for are realized and articulated, for development of a simulation that can be used not only for war gaming at the brigade level, but also serve as a tool for teaching history and aiding in the visualization of a battlefield. Though our CTCs currently provide many useful products, they are not typically integrated into unit training. Nor are the detailed after action

reviews--the history of these mock battles in their crudest form--released to other than the unit that trained.

A new generation of simulations for future battle command could display battles of history and provide both innovative and interesting means of learning and discussing past battles. The National Simulation Center recently modeled the Battle of Little Horn in the JANUS simulation. Though an excellent tool for enhancing learning, brigades of the future would need a military or contractor content provider to develop products. Once developed, these products have utility for a much broader audience than just the brigade. This also opens the possibility of digital staff rides. Long recognized as a useful means of teaching and training, the cost and expense of physically traveling to all but local battle sites will remain prohibitive and time consuming in the future.

The leveraging of simulation technology as a tool to help foster the basic skills needed for mental agility would now open up the world for unit staff rides. Sites in hostile countries or otherwise changed over the years could become part of this training database. These products would be part of a larger data warehouse for training. A professional development class on double envelopments, for example, could include a digital staff ride or historical presentation of the battle of Cannae. Staff officers could be tasked to search a historical training data base for other examples in their BOS that relate to that battle or this form of maneuver. Ideally, this system would be accessible by the same digital systems they would use in a tactical environment in the TOC. This database search would also reinforce the technological or keyboards skills they need to access and

analyze information in a tactical environment. The class and professional discussion might include the encirclement and surrender of the better part of two U.S. infantry regiments in the Battle of the Bulge.

Played out in simulation and combined with historical study, the commander and staff could perform their own after action review. In a historical model linked to an actual simulation, the commander and staff might even refight the same battle. Particularly in the case of defeats, the professional discussion might include frank discussion as to whether the commander and staff would have made similar decisions if they had the same information as the historical commander and staff. How would they manage information differently? What were the key elements of information, when were they needed and could they in fact have been acquired?

Use of digital and space based terrain products, such as multi-spectral imagery, in digital staff rides and historical or tactical simulations would further train and familiarize the commander and staff in the use, strengths and weaknesses of various space-age products. Classification issues not withstanding, the same tactical communications and data channels and processing equipment used to access these products in a tactical environment, whether ASAS, MCS, or a next generation system could be used to access training products. Though this is not necessary it would add an information age battle-drill and add tactical value to what today might be an administrative task. Parallel classified or real-world, and unclassified channels could also be established. The essential tasks remain the same and only the access codes or passwords would be different.

In all cases the after action review, a uniquely American contribution to the training of mental agility, would remain a key catalyst to the development of cognitive skills in battle command. Perhaps pioneered by Walter Krueger in the Louisiana Maneuvers, its utility has come to be recognized by CEOs and college professors. A newspaper reporter and veteran correspondent of the Vietnam war, after observing an NTC AAR commented "I learned more by watching and listening to this AAR on the mock battlefield than I had learned from some of the real battles I had been in two decades earlier in Vietnam."[34] CTC O-Cs are recognized and acknowledged for the valuable skills they gain as highly trained observers. Allowing leaders within a brigade to gain similar experience by providing a CTC-like experience in simulation at the brigade level merely leverages proven and existing techniques for raising officers to a higher level of professional expertise.

Linking innovative instruction at the brigade to the techniques of critical thinking and critical analysis would further force the commander and staff to think, analyze, synthesize and evaluate information and help their cognitive processes grow and mature. The advantage of conducting this type of experiential and advanced learning in the unit environment is the added benefit of contributions to team building. In an environment outside a typical CPX or field exercise, commander and staff would gain first hand experience in the strengths and weaknesses of each member of the staff in mental agility. The team could learn to accentuate strengths and minimize weakness. The goal, and a topic for further research is whether such a training regimen could help a battle command team gain the

synergies achieved by Patton and the Third Army staff in something less than the two plus years it took them to learn.

That these skills are trainable, and within the grasp of the typical staff officer to improve with the help of the right teaching and tools has been recognized for centuries. Before the Prussian Army suffered a disastrous defeat and engineered a system to institute excellence in its officer corps, an earlier leader wrote of what he called the Coup d'oeil or the quick glance. Though his writings were more concerned about undisciplined soldiers who would desert if not closely watched, he noted that "we must endeavor to improve ourselves by means of our own genius and imagination, so as to learn, even in time of peace, a science so useful and necessary."[35] Though referring to "our own genius," he did not insinuate that only the most gifted officers could develop these skills. In his *Military Instructions to his Generals*, Frederick the Great stated, "This art is to be acquired and even brought to perfection, though a man be not absolutely born with a military genius."

What lessons would we learn if we conducted a staff ride of Kasserine Pass and were forced into the shoes of the commander and staff of II Corps? Or of the commander of 1st Armored Division? Or of any one of a number of brigade sized units left to the mercy of numerous factors of war, including the quarrelsome relationships between their Division and Corps commanders? Even the great tactician Rommel hesitated. Partial information and incomplete reports were misinterpreted. Would a flood of information through digital systems have made the battle easier or harder to fight? The opportunities

to use history and past experience as a springboard for new learning and new experience are endless. The battle need be no older than a recent rotation to a CTC or as ancient as Alexander the Great.

As Patton used 4,000 years of military history to draw conclusions about a future war ten years before he fought in it, history too shows that the teamwork between commander and staff and the training of the commander and staff are key to success. Though history acclaims him as one of the greatest warriors of all time, even Alexander the Great had a staff to help him achieve his victory and glory. That he succeeded could be considered as prima facie evidence of some form of staff training. Like Patton, he too listened to and heeded the advice of his staff. Though a man of action, he was "rarely deaf to counsels of caution well argued."[36]

Before the Battle of Gaugamela in which his smaller force of Greeks defeated a larger force of Persians, he asked his counsels whether he should immediately advance his phalanx or first make a thorough reconnaissance of the enemy dispositions. The majority argued for an immediate attack. Perhaps overly confident in their abilities and flush from earlier victories, or afraid to appear weak and hesitant in front of the boss, or believing surprise and decisive action would catch the enemy off guard. Perhaps there was a bus to Abilene long before buses were invented. One officer argued for caution, and Alexander accepted his advice. Alexander defeated the Persian Empire at the Battle of Gaugamela.

Alexander did not always accept this officer's advice, but perhaps part of his genius lay in the fact that he had a staff who could argue both sides of a position and al-

low him as the commander to make a decision armed with the best possible information. Whether information is delivered by a sandled messenger or a satellite modem, the basic principle remains the same.

Futurist Alvin Toffler in his book *The Third Wave* mused that it may be more important to ask the right question than to get the right answer to the wrong question. Alexander the Great asked the right question. His staff debated the question and tried to come up with an answer. Had the staff sought one-hundred percent consensus, or picked their favorite course of action to present to the commander and not given him a choice, the outcome may have been different.

Perhaps the essence of future battle command is as simple as learning to ask the right questions and to provide the best response or responses to those questions. Maybe the right questions are needed to focus the staff and ensure they provide the "minimal essential information at the right time to the right people for action/decisions."

"The key to success," as Sir Michael Howard noted a quarter century ago, "is a willingness to experiment and to learn from one's mistakes."[37] As George C. Marshall testified to Congress in 1941, our goal must be to make these mistakes in training to prevent having to learn them in combat. We must leverage the same technology we hope to use to gain information dominance over future enemies by applying it to the training and education of the mental agility in battle command. Highly trained soldiers will increase our probability of success in a rapidly changing world full of new and old threats across a broad spectrum of conflict. Commanders and staffs must be skilled in both the mechani-

cal skills of their technology and the mental agility to use these systems in tactically creative, innovative, and even imaginative ways.

The value of individual and collective knowledge in war, its utility in increasing combat power, and the benefit of a highly skilled staff have long been recognized. Efforts to attain the advantages and synergy of knowledge, and the systems and tools used to create, share, and process it will continue to be a challenge that requires dedicated and continuous efforts and the unique qualities that individual commanders and staffs bring to a broad spectrum of tactical decision-making.

> A wise man is strong; yea, a man of knowledge increaseth strength. For by wise counsel thou shalt make thy war: and in the multitude of counsellors there is victory.
>
> Proverbs 24:6-7

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CHAPTER 6

CONCLUSIONS

> The capability to fight wars is the ultimate purpose of the Army, and the Army exists to support its most valuable weapon, the individual soldier. War-fighting capabilities must be consistent with the principles of objective, offensive, mass, economy of force, maneuver, unity of command, security, surprise, and simplicity. Information age changes should support and hopefully increase practical application of the Principles of War.[1]
>
> Lieutenant General (R) Frederic Brown,*The U.S. Army in Transition II: Landpower in the Information Age*

This study offers no panacea. Creating excellence in brigade battle command in the next century will require hard work, dedication, and determination from both leaders and led, students and instructors. It will be an individual and collective effort and will require vision, focus and emphasis from echelons above brigade.

Though the Army cannot manufacture the genius of a Patton or a Rommel on an industrial age style assembly line, it can create an environment of continuous training, education, and learning that fosters development and growth of the skills needed for the mental agility battle command requires. The Army must focus on training excellence in battle command at the brigade level for two reasons.

First, this echelon will grow in importance as a key building block for future warfighting. Whether it replaces the division or not as some have suggested is irrelevant, though if it does the urgency of mental agility at this echelon becomes more pronounced. The brigade of today already employs the combat power of the divisions of the 1950s and 1960s.[2] The increases in target acquisition, engagement range, precision, and lethality

made possible by new technology will further increase the combat power of a brigade in the next century.

Second, the Army is in transition between the industrial age and the information age, and is still adjusting to the new potential the computer chip provides to military operations. Exploiting this potential requires the innovation, imagination, and creativity that only highly training and experienced commanders and staffs can provide. Historically, American innovation comes not from the top down, but from the bottom up. Historian Stephen Ambrose observed that in the American Army of World War II it was soldiers at the lowest level that brought out problems with doctrine and equipment and worked to overcome these problems.[3] The officers and NCOs involved in battle command will pay back a long-term dividend in innovation, imagination, and creativity in return for an investment made in their mental agility at this stage in their careers.

The essence of how people collectively solve problems has little changed in the past few thousand years. The problem is not in the process itself, but rather in how participants in the process think, apply, and execute the process. Problems at the brigade level will increase in complexity with the overall increase in complexity of the larger tactical, operational, and strategic problems the Army faces in the future.

Though the emphasis and investments in new technology, specifically hardware and software, have grown, as has emphasis on training the mechanical and keyboard skills necessary to use this equipment, emphasis and investment in the mental skills or brainware has not. Mental agility or the ability to execute battle command at a level of synthe-

sis rather than by rote or checklist is essential to leveraging the full potential of technology on the battlefield.

Time

Though not directly related to battle command there exists a need to leverage technology and reduce industrial age reporting tasks to free more commander and staff time at home station to focus on training mental agility and battle command synthesis. Though the private sector has used technology to reduce paperwork and shift to network style organizations that share and leverage information, the military has lagged behind in reducing the workload at the tip of the spear.

Systems such as the Standardized Installation/Division Personnel System (SIDPERS) and others are unfortunately structured to support upper level management, and though capable of reducing workload at the unit level, are not designed or structured to do so. For example, though SIDPERS contains personnel data, it cannot typically be shared with other applications. Rosters and reports requiring personnel data cannot be generated from the database and must be manually generated in other programs. Logistics, personnel, and training systems are stand-alone, stovepiped systems. Rather than leveraging information to improve efficiencies, many legacy systems currently in place simply automate industrial age hierarchies. Though technology is capable of reducing workload, it will not until a deliberate effort is made to develop next generation systems.

Lost time at the unit level is not always viewed as a "loss" at higher echelons. Resources are typically measured in terms of dollars, not time. Soldier time is consciously

or unconsciously viewed as a sunk cost, as no additional funds are expended for its use, nor are financial savings accrued for using it efficiently. Conversely, many executives in the private sector view time as a key resource. "As a strategic weapon," a corporate consultant reports, "time is the equivalent of money, productivity, quality, even innovation."[4]

Agility depends on efficient and effective use of time. Experience with information technology leveraging time in administrative, logistics, and other garrison functions not only frees a key resource for battle command training but also provides experience to staff officers that would carry over to tactical functions and provide a basis for developing mental agility in battle command. Providing time by leveraging technology and reducing requirements is a precursor to any attempt to train twenty-first century battle command.

Training

Developing cognitive skills and working up to the ability to execute battle command at a level of synthesis is an incremental process. Military schools provide the essential knowledge level tasks of memorization, recognition and recall of doctrinal principles, terms, graphics as well operation of basic equipment and systems. Skills in operating information systems and other high technology systems are perishable and require periodic retraining.

Wherever practical, future battle command should merge tactical and garrison information systems to reduce the need for repetitive retraining, and make daily operations

part of training. An S3 receiving e-mail from the G3, for example, should receive and process it on the same system he or she will use in the field. A commander, staff officer, or NCO trying to remember where to find a computer menu or how to access certain information is hampered in exercising mental agility. Certain systems may require users to periodically test and qualify on their information system in a process analogous to weapons qualification. A license and periodic retest is required to drive a car. The future TOC drives far more than a single automobile.

Part of teambuilding should include instruction and awareness in the thinking styles of each member of the staff. The goal is to help individuals better understand their own strengths and weakness, as well as help the staff as a whole understand their collective strengths and weaknesses. Though not a scientific study, a former Combined Arms and Services Staff School (CAS3) instructor who used Myers-Briggs as an aid to teambuilding observed that understanding thinking styles gave young officers better insight into their own personalities. When they saw discussion bog down in heated discussion and debate they learned to recognize the different thinking styles at work in class discussion and gradually overcame these hurtles.

Debate and discussion is productive and helps generate diversity of thought and mental agility, but must be managed to ensure professional debate does not devolve into personal animosity. Students found that an understanding of thinking styles, and the moderation of their staff leader, improved teambuilding and decision making in the staff group.[5]

The Myers-Briggs test is only one of several instruments available to help in this effort. Learning the strengths and weaknesses of the staff is not the only goal. Understanding the thinking style of the commander is also particularly important.

Field Marshall Montgomery's staff learned this in World War II. Montgomery was a meticulous planner and loath to change his plans once he made them. His staff had to develop showmanship techniques and develop a sort of "Monty language" to allow them to communicate new information to him in a way that would make it palatable to him to authorize changes.[6] This example is somewhat extreme, and in the information age (or any age) these methods cost time and unnecessary delays. A better understanding of thinking styles is far more efficient.

A more effective means of communicating information was demonstrated by the commander and staff of Third Army in World War II. They met every day for an informal session to exchange ideas and information. One staff officer described the sessions as "freewheeling and free-thinking." The G2 briefed prior enemy actions, current enemy capabilities, and possible future actions. What followed was a "thinking out loud" session by all present. "If the enemy does so and so," the commander would ask, "What do you think of our doing this?" A member of the staff would remark that "if such and such does happen we are in a position to do this." The commander then might say, "I'm going to do this--or this--depending upon the situation at that time."[7]

The staff knew not only how the commander thought, but what he was thinking every day. After these sessions, usually no more than fifteen minutes long, the same

information was briefed to the extended staff of assistants and NCOs so they too knew what was on the commander's mind. This focus allowed the entire headquarters to comprehend what was important and what was not. It aided in the assimilation of information and facilitated initiative by the staff.

There is a tendency for people of different thinking styles to experience conflicts and communications barriers. Lack of understanding, information assimilation, and the communication barriers that can develop due to personality can impact battle command. Ten days prior to the ill-fated "Market Garden" operation in 1944, the G2 of the British I Airborne Corps reported to the Corps commander and operations officer that two Panzer divisions had been identified on the objective in Arnhem. He expressed concern, and recommend reconsidering or adjusting the plan. His commander, believing that the G2 had lost his nerve, had him sent home to England. The intelligence information was never disseminated to the commander who went in on the ground.[8] Ironically, the Germans demonstrated perhaps a textbook case of the mental agility sought in battle command. Within three hours of this completely unexpected and surprise attack, the German commander and staff had developed a plan in response to the landing and set it in motion.[9]

Initiative is one of the key cognitive skills needed for battle command. This skill cannot be taught, however, but must be developed. When asked about the initiative of German soldiers in World War II in interviews with General (R) William E. Depuy, German General Hermann Balck felt compelled to explain.

> Generally the German higher commander rarely or never reproached their subordinates unless they made a terrible blunder. They were fostering the individual's initiative. They left room for initiative, and did not reprimand him unless he did something very wrong. This went down to the individual soldier, who was praised for developing initiative. Of course, there were exceptions, and there was sometimes trouble, but generally independent action along the line of the general concept was praised and was accepted as something good.[10]

Though the old training litany called for a progression from competence to confidence to initiative, Balck's point makes it clear that to exercise initiative, a soldier must be given the opportunity to experience it, and when doing do, praised and rewarded. This is clearly not possible in a "zero defects" environment. Von Mellenthin warned that "Purely rigid training squeezed the lower commanders into the vice of manuals and regulations, and robbed them of the initiative and originality which are vital to a good tactician."[11] This is only one of several areas involving the cognitive skills of battle command that require the direct and personal involvement of the commander in the training the staff.

Experience is key not only for learning and fostering initiative, but for all other cognitive tasks of battle command as well. Balck's Chief of Staff, A.D.F.W. von Mellenthin stated, "We found that leaders at any level grow with their experience. [Their] initiative should be fostered in the case of a division commander just as much as in the case of a platoon commander."[12]

The military theorist Carl von Clausewitz also recognized the value of experience in developing the skills need for the military art. In *On War* he stated, ". . . experience counts more than any abstract truth."[13] Though actual combat experience is arguably the

best teacher, it paradoxically requires experience before hand, and can charge a harsh and unforgiving tuition for the inexperienced. Wags at the turn of the century observed that it took 15,000 casualties to train a major general. The potential cost of inadequate training argues for sustained and even increased spending on training to guard against having to gain experience in this way. War is not meant to be a educational experience and is in truth a time for practiced execution, not learning.

This is not to say that the Army as a learning organization does not continue to learn, disseminate and discuss lessons in combat. The fielding a new piece of enemy equipment, a change in their tactics or the strengths or weaknesses of certain enemy units are just a few examples of the information which must effectively be exchanged and disseminated.

The CTC institution is a uniquely American solution to the problem of providing experience and institutionalizing excellence in the Army. Through the combination of the technology of an instrumentation system that provides data for training feedback, the more detailed observations of a highly skilled cadre of observer-controllers, and a free-playing OPFOR, the centers provide an unparalleled combat university for combined arms training. With the growth and addition of brigade-level training teams in the mid-1980s this experiential learning opportunity expanded to cover the brigade commander and staff and opened a door to brigade battle command.

The CTC methodology captures and improves on many of the best features of the training centers of World War II. Linking the data from the training centers to the data

warehouse of CALL provides essential tools for transforming the Army into an information age learning organization. But data alone does not create mental agility. Mental agility requires more. "We know too much and understand too little . . . . We absolutely must share data to make sure it is accurately understood," says John R. Messier, President of GTE Federal Systems.[14]

But even with the availability of shared data from the CTCs in the form of lessons learned, brigades continue to experience problems with battle command. These problems have persisted through history and are overcome only with great effort. They are not solved by doing more of the same. They will not be solved by adding a new course or a few new hours to the curriculum of any existing Army school. And as the inevitable press of technology increases the importance, tempo, and volume of information in battle command at brigade coupled with reduced funding available for maneuver training the problems can only get worse.

The problem is not in the tactical skills of our commanders and staffs to plan operations but in their cognitive abilities to apply individual and collective knowledge in the far more difficult environment of execution.

Industry too recognizes the importance of execution as opposed to the process of planning. The purpose of planning is to facilitate successful and profitable execution, maximizing strengths and minimizing or avoiding risk or weakness. Investments in mental agility skills and planning are means to an end, and not an end unto themselves. As Hewlett-Packard CEO Platt emphasizes, "Execution is eighty-percent of the game."[15]

A solution lies in providing more experience for our commanders and staffs. Mental agility is not developed in a lecture hall. Combat and repeated field problems would provide experience, but a peacetime Army is not likely to receive the funding for this. A study of history at its crudest form at the tactical level is one means of transmitting experience and the use of tactical simulation is another. Used together they have the potential to lift the Army above the battle command performance plateau that CTC lessons learned indicate.

The study of history is not intended to turn commanders and staffs into scholars but is a means to foster development of a wide variety of experiences to provide the mental models needed to exercise mental agility in both planning and execution of a tactical situation. Patton explained in simpler terms that "In order for a man to become a great soldier . . . it is necessary for him to be so thoroughly conversant with all sorts of military possibilities that when ever an occasion arises he has at hand with out effort on his part a parallel."[16]

Part of the value of history is that it can reinforce our doctrine and the theory necessary to assimilate new information and experience. The dean of American theory on quality, Dr. Edward Deming, believes that "Knowledge is prediction, and knowledge comes from theory. Experience teaches nothing without theory" He warns people not to copy someone else's success. "Unless you understand the theory behind it, trying to copy it can lead to complete chaos."[17]

As commanders and staffs seek to filter out extraneous information and focus on the essential in battle command, their study of history should be focused in much the same way. Schlieffen's use of the ancient battle of Cannae was a study in the importance of attacking the flank, of fixing forces, penetration and of the double envelopment. It was not a study in the tactics of the long spear or the Spanish sword.

History could also more efficiently be used to reinforce and teach lessons of the doctrine and theory that guides operations at the brigade. History does not just teach lessons, such as the conceptual possibilities of the double envelopment, it also tells a story. In teaching adults, storytelling is entertaining, keeps their attention, and helps reinforce learning. Research suggests that well "storied" information is easier to assimilate with existing knowledge and is longer remembered.[18]

History does not need to be just what is in the history books. Over fifteen years of battles at the CTCs now provide a wealth of information that could also illustrate doctrinal principles and lessons learned. Past rotations to the CTCs are as much a part of Army history as the Louisiana Maneuvers. Each provides a wealth of data and information. But as veteran intelligence officers observed when they wrote a book of their lessons learned from World War II, "Information is of no value to anyone unless it is acted upon."[19] But when units and individuals use and act on information, and information is used to expand the mental maps used in the brainware of battle command, they can achieve information efficiency and synergy. "Plainly, the more history one carries in

one's head about more centuries or countries--or institutions, issues, individuals, whatever--the less one has to scramble . . . when the need arises."[20]

A further value and synergy can be achieved by linking new technology and multimedia products to the use of history as a tool for professional development in brigade. Digital terrain can provide a more three dimensional view of battlefields. Learning to visualize known battlefields through the eyes of past commanders can help develop the mental maps and skills needed to visualize future battlefields.

When the German General Staff introduced *kriegspiel* as a training tool in the early 1800s, the essence was "the opportunity for officers to operate together as a team of commanders and staffs in dealing with realistic combat situations on maps which might or might not represent actual terrain."[21] The use of simulation provides the same opportunity on a much better medium. JANUS and other simulations are already used by many innovative commanders today as a training tool, but a new generation of simulations that requires less overhead to operate and can be networked in the brigade area rather than at a simulation center should be developed for training future battle command. Ideally, with more time available at the brigade, such simulations would be used more often.

Simulations have been shown to improve adult learning of the higher order thinking skills needed for battle command. The Basic Training litany of I hear and I forget, I see and I remember, I do and I understand is quantified in research. In one study, "it was found that students remember 10 percent of what they read; 20 percent of what they hear; 30 percent, if they see visuals related to what they are hearing; 50 percent, if they

watch someone do something while explaining it; but almost 90 percent, if they do the job themselves even if only as a simulation."[22]

A learning strategy based on higher order thinking skills should be based on three principles: creating an intriguing and interesting learning environment, make use of multi-media capabilities to combine visual and interactive learning experiences that help learners form mental maps or representations, and develop a "cognitive architecture" that helps to apply new knowledge to old and create a true "learning experience."[23]

Particularly when tied to a strategy of "guided learning" or "discovery learning," simulations "enhance students' problem solving skills by giving them an opportunity to practice and refine their higher-order thinking strategies."[24] Drills in which staffs create orders, but do not see them executed do not provide this experience. It is necessary to see a relationship between cause and effect to gain the full value from this type learning. The current strategy in which more time is spend developing orders and battle command products and less time spend exploring them in the simulated reality of execution does not fully develop higher-order skills. Future battle command requires more balance between training in planning and training in the far more difficult environment of execution.

The Prussian Army instituted this technique for institutionalizing excellence with use of kriegspiel down to the regimental level. Though simulations are far more sophisticated than a checkerboard or map, almost 200-years later, the Army does not have an equivalent tool at the brigade level as readily accessible and as easy to operate as it was in the early 1800s.

A networked simulation in the brigade area would also save the time of moving to a simulation center and be more readily available on a day-to-day basis. Such technology could be leveraged not only by the brigade commander and staff, but by all units down to platoon and squad level. The system would need the capability to "stimulate" tactical information systems. Provided the tactical systems are integrated into day to day operations, a commander could run a tactical "fire drill" on very short notice, and help to keep officers tactically focused even in garrison.

The methodology first introduced in the Louisiana Maneuvers in 1940 and institutionalized at the NTC and later the CTCs of a competitive OPFOR, simulated combat, and after action reviews revolutionized Army training and provided a valuable base of hands on experience that created the mental agility to conduct AirLand battle. The decisive victory against the Iraqis in Desert Storm is often credited to the training done at the NTC and the CTCs.

But the Iraqis were not a peer threat and sufficient time and facilities were available for a deployment and build-up of forces. Future brigade battle command will typically be more demanding, more information intensive, and faster paced. Current experience at the CTCs and a history of recurring problems in certain key areas of battle command show we've hit a plateau that the current training system is not structured to overcome. Our industrial age education system is slowly evolving to an information age system. The pace of change demands a continuous education and a shift to a learning organization environment.

One way in which technology could be leveraged to train the mental agility would be to follow a training technique used by the Israeli Defense Force (IDF). Concerned that their reserve officers had less capacity than their regular officers for quick thinking and bold decisions in combat, they developed a three day CPX to exercise and evaluate these skills. Part of the problem was that these civilian officers actually followed orders too well.

"The civilian leader undeviatingly responded to orders. He was less likely to see the opening clearly and change his line abruptly when the battle became fluid."[25] The CPX started slowly, with a standard mission assigned, aerial photos and other intel provided, and twenty-two hours to plan. After presenting their plan, the received an abrupt change of mission. The objective is shifted ninety degrees, and the commander and staff receives thirty minutes to adjust his plan. At the same time, information is coming from the companies up through the TOC. After presenting the second plan, the commander is given a situation where the battalion's taken casualties, they must immediately counter-attack, and the command must present a decision immediately, without assistance from the staff. In the final phase, unlike U.S. CTC exercises, where force ratios and enemy strength is calculated to provide a "fair" fight, the IDF exercise provides enemy strengths and time/distance factors that make the mission just barely possible to accomplish.

Such a simulation could easily be run in the brigade on an in-house simulation. An added benefit is that with the capabilities of networks, the unit could leverage trainers and OPFOR from a subordinate battalion or from a brigade in another division on the other

side of the globe. Expert trainers from a CTC, BCTP, CGSC, or any branch school could review the simulated battle by reviewing both the recorded simulation and orders placed in MCS as well as other digital products. Best of all, by running multiple repetitions of the same or different battles, units could increase experience and learning in the cognitive skills of battle command. The units own simulation experience would serve as a basis for professional discussion and future training.

Another way the simulation might be used is to start with a professional development class on a historic battle. The Battle of Kasserine Pass or the envelopment of two U.S. regiments in the Battle of the Bulge (referred to as "Cannae in the Schnee Eifel" in the official Army history) could be presented as a formal professional development class and a digital staff ride using the three-D terrain capabilities of either the simulation or a tactical C3 system. Each staff member would represent their BOS and brief the key actions and lessons learned. Following this professional development session, the staff could be issued instructions to prepare an order for a contemporary unit to operate on the historic terrain.

The brigade in any combination of virtual and constructive simulation would fight the battle and conduct the appropriate AARs. Multiple iterations could be fought as required, or additional professional development classes conducted following the simulation. The third phase would require the staff to plan and execute in a compressed planning cycle an operation on completely new terrain. Digital terrain provides wide possibilities. Any terrain around the world could be used. As it is already in a digitized

database even terrain on the surface of Mars could be used and modified to show vegetation, urban areas, and other features necessary to train.

Such a system presents obvious possibilities for distance learning. The embedding of training capabilities in tactical systems would not only support train-as-you-fight in a garrison or peacetime environment, it would also recognize that even units in combat must train. Units that become proficient in using simulation to conduct wargames as part of training also gain proficiency in war gaming. The use of mission planning tools that allow digital war gaming would be enhanced by the training on these systems that units would exercise as part of their brigade simulations.

Such a training system for brigade battle command could be part of a larger data warehouse for training data, manuals, etc. The database maintained by CALL is already a step in this direction. However, use of this or any database requires skills in accessing data and developing queries. Brigades of the future would benefit from a Wal-Mart-style data warehouse of training data that includes not only raw data and lessons learned, but pre-formatted instructional materials as well. The 1st Armored Division staff ride of Kasserine Pass is available in the library, but who will be responsible in a future system of virtual educational support of turning these products into the multi-media support materials and digitized battlefield graphics and products needed to conduct a virtual staff ride? This products must be available not just to selected commanders and units but to the wider audience of the Army as a whole.

As future brigade battle command will be interdependent on networked resources providing intelligence, instructions, and a host of other information, the training of future battle command will also be a networked and interdependent affair. It will take advantage of distance learning and demand the construction of new electronic classrooms.

The shift to an information age education system for brigade battle command must be more than providing access to information on the internet. A next generation of simulation systems that allows a simulation to be both a tactical simulator and a means of displaying historic battles, whether they be Alexander the Great at Gaugamela or the brigade's most recent CTC rotation will require planning and money. But the money spent must be seen as an investment in the mental agility and brainware of our next generation warriors. If technology is simply viewed as a way to save money and cut personnel we risk falling prey to a focus on technological superiority that underestimates the value of human resources.

In the words of one business theorist, "money will buy gadgets; it will not buy knowledge."[26] To leverage our information systems and develop excellence in brigade battle command demands the knowledge and mental agility of highly trained commanders and staffs.

A historical lesson learned from Sir Michael Howard is that "As military science develops, innovation tends to be more difficult than less . . . .In these circumstances, when everybody starts wrong, the advantage goes to the side which can most quickly adjust itself to the new and unfamiliar environment and learn from its mistakes."[27] With an

investment in the mental agility of the soldiers who serve as the "credentials" of the U.S. Army, brigade commanders and staffs can train and educate excellence in battle command and sustain the innovation necessary to adjust and adapt to any unfamiliar environment.

In the future, as in the past, "the chief factor in achieving triumph is what has been done in the way of thorough preparation and training before the beginning of the war,"[28] or any other mission assigned to a brigade. Old methods are not necessarily bad, but they must be updated and adapted to new realities. Those which no longer fit must be discarded. Mental agility and the cognitive tasks of battle command help units to know the difference.

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APPENDIX

COMBAT TRAINING CENTER OBSERVATIONS

> The NTC and JRTC provide the U.S. Army with important and needed field training that improves combat skills and most probably will save U.S. lives in future conflict; however, the Army does not appear to be making as full and complete use as it should of these facilities for the purpose of improving combat skills and doctrine.[1]
>
> George C. Wilson, *Mud Soldiers*

The following observations on issues relating to brigade battle command are extracted from CALL products of observations, trends, and lessons learned at the JRTC, CMTC and BCTP. They show that information presented for the NTC in chapter three is consistent with observations at all the training centers. The majority of observations fall under the battle command dynamics of information assimilation, communication, decision-making, and visualization.

These deficiencies also involve or negatively impact the battle command tenets of initiative and depth, which require commanders and staffs to visualize and anticipate key events, times and places; agility, which requires rapid and accurate decisions and actions; integration, which makes synchronization of activities at decisive time and places possible; and flexibility, which involves the ability to react to unplanned or different situations. Through inaccurate, incomplete, or untimely information processing and management, which includes battle tracking, the trends also impact on the tenet of judgment or the process of forming an accurate opinion or estimate based on available information.

JRTC

R&S planning and execution are recurring deficiencies. R&S plans are not integrated with the rest of the staff or synchronized to support the unit mission. As the plan is usually issued before the OPORD and seldom updated, it is not integrated with the courses of action or commander's information requirements and has less than effective results. Development of PIRs early in the staff planning process can strengthen, refine, and focus R&S plans. Lateral coordination and coordination with higher headquarters is needed to ensure full coverage of the area of operation.[2]

Brigades plan and brief night operations as part of scheme of maneuver but rarely execute as planned. Night operations frequently are not to standard and do not meet the commander's intent.[3]

Brigade executive officers and staffs lack practice on the steps of the Command Estimate Process and do not provide adequate products at the end of each step. Course-of-action (COA) development and wargaming lack sufficient detail to support effective decision making.[4] Wargaming is key to developing a basis for visualizing a battle.

Brigade synchronization suffers because the entire staff does not work together to develop an integrated plan and do not conduct sufficiently detailed analysis in COA development. "Not all of the staff participate in the COA development and wargaming process." Actual wargaming of COAs or the selected COA rarely occurs. "Wargaming often turns into a *pro forma* planning step, rather than a though provoking interactive

session which identifies blemishes and flaws in a basic concept."[5] Critical thinking, not a checklist check-the-block mentality is needed for effective battle command.

Brigades typically fail to develop a clear visualization of the impact of enemy and terrain. This analysis is not a coordinated staff effort and is relegated to the S2 without the benefit of analysis and expertise from BOS experts in the staff. A wargaming of enemy courses of action would help develop a better visualization of the enemy and their use of terrain. Improved visualization of enemy and terrain enhances overall visualization of the battlefield and would improve friendly course of action analysis.[6]

Staffs do not effectively integrate and synchronize brigade assets and combat multipliers in deliberate planning, leading to disjointed plans and uncoordinated execution.[7]

Rehearsals are typically detailed back briefs rather than true rehearsals. Units spend more time on the relatively easy task of building terrain models than on the mentally challenging substantive issues of the rehearsal. Brigade commanders and staffs do not conduct adequate preparation for rehearsals.[8]

Maneuver brigade commanders and staffs are weak on air assault planning and air mission briefing (AMB). These tasks are typically passed off to aviators and S3 Airs. Commanders and staffs do not get involved or assist in the effort. The result is poor execution of air assaults.[9]

Military Intelligence (MI) company assets are not integrated in R&S plans or coordinated by the brigade staff.[10]

The role of Psychological Operations (PSYOP) is not well integrated with maneuver plans or coordinated with the brigade's scheme of maneuver. PSYOP missions are not successfully conducted in support of brigade operations.[11]

Civil Military Operations (CMO) estimates tend to focus at the regional and country level and do not focus on brigade operations. CMO does not focus on the brigade mission.[12]

Poor battle tracking and timely management of information in the brigade TOC affects the commander's ability to exercise initiative, exercise agility, and make timely decisions. Information needed to answer CCIR is not rapidly reported and disseminated. Unit reporting is late. Maps, status charts, unit locations, and combat power are not kept current, and commanders are unable to get quick, clear snapshots of the status of the current battle. Battle tracking is frequently poor in all staff sections.[13]

"Commanders do not always have a clear vision of the battlefield because reports are either untimely or staff members do not seek and compile the critical information the commander needs."[14] Staff members must aggressively track the critical information required by the commander. Simply tasking someone to find information is not enough. The collection effort must be managed and monitored. The Battle Captain is a key staff member for information management. The CCIR help focus the information management and prioritize the flow of information.

Commanders and staffs do not fully comprehend the C3 architecture available to support their operations. As a result, information is often lost or delayed because a battle

captain "does not know what communications assets are available to 'get the message through.'"[15]

CMTC

The R&S plan is key to the detection and tracking of targets for engagement by fire support assets, but the S2 and FSO do not work together to develop a coordinated fire support and R&S plans. Units typically do not effectively suppress enemy observers and positions at obstacles during breaching operations and assault on the objective. Fire support plan is not effectively integrated with scheme of maneuver.[16]

The reconnaissance effort is the attack is not focused and lacks specificity and detail. The commander attacks because it is time to attack, not because he has sufficient information developed to decisively engage the enemy.[17]

Intelligence Preparation of the Battlefield (IPB) is not integrated with the R&S process. Information developed from IPB is not effectively integrated with R&S plans, or IPB products needed to support integration, such as the event template, which graphically portrays enemy courses of action, are not developed. Commanders and staffs allow the S2 to develop R&S plans without integration of requirements from other staff sections. In other cases, the R&S effort is delegated to an Asst S2 without guidance or quality control by the S2. In all cases an unfocused, incomplete, and inadequate R&S effort results.[18]

Commanders and staff unable to use IPB to effectively visualize the enemy and terrain. IPB products developed as a sequential step-by-step process rather than a

continuous one. Products are not updated and improved as more information becomes available. IPB products that should be easy to assimilate up-to-date graphic representations of the best available information are instead outdated and inaccurate products representing past history instead of current events.[19]

Staff officers are weak in the ability to analyze time-distance factors for both friendly and enemy maneuver. A picture of friendly and enemy actions over time is key to battlefield visualization. S2s frequently underestimate enemy movement rates, while S3s overestimate the speed at which friendly units can move in limited visibility. These problems are not identified or corrected by the commander or other staff members during wargaming, and result in weak synchronization planning and ineffective decision support templates.[20]

S2s and other staff members lack the mental flexibility to apply the conventional warfare IPB process in an OOTW environment. The steps of IPB are the same in both environments, but application requires a change in thinking. Definition of the battlefield environment expands to include the population as part of the environment in OOTW. Rather than templating conventional engagement areas, the focus shifts to likely ambush sites. The intelligence situation map tracks not movement of enemy units and a posting of unit symbols, but a tracking of battlefield events. Demonstrations, vandalism, weapons caches, and terrorist incidents replace the movement of echeloned enemy forces moving on avenues of approach as indications of enemy courses of action.[21]

S2 sections are often overwhelmed by the volume of data in OOTW operations. Procedures for managing, filtering and disseminating critical information are not thought out in advance. Brigades flood subordinate units with unfiltered and unanalyzed information. Reporting is often incomplete and untimely. Critical information is often lost in the clutter of less important reports.[22] Inability to turn data and information into timely intelligence inhibits visualization of the enemy, assimilation of other information regarding the enemy, and degrades rapid and effective decision making and agility.

Mission analysis for OOTW operations lack detail. S3s and staffs have difficulty in making the mental transition from developing specified, implied, and essential tasks for conventional operations to mission analysis for the occupation of a Zone of Separation (ZOS). An OOTW operation may require the same degree of detail as conventional operations. Units fail to anticipate the effect of low visibility on operations as well as problems associated with mine clearing along march routes during deployment and establishment of the ZOS. OOTW operations can benefit from detailed rehearsals as in conventional operations.[23]

Brigade rehearsals are typically no more than a back-brief from subordinate commander. In other cases inadequate staff wargaming results in rehearsals becoming course of action analysis sessions. "Rehearsals fail to focus on anticipated subordinate commander and staff actions, likely enemy reactions, and friendly counter-actions."[24] Without a clear visualization of critical friendly and enemy events and actions, the commander, staff and subordinate commanders are less prepared to exercise initiative or

agility on the battlefield. Without the benefit of a rehearsal, the assimilation of information within the staff and between higher and subordinate units necessary to achieve integration and synchronization of key activities at decisive points is more difficult to achieve.

Units understand the fundamentals of breaching operations but fall short in effectively synchronizing assets and effectively executing. Failure to rehearse the TF beach is a typical cause. Ineffective reconnaissance, failure to suppress enemy, and poor timing of artillery delivered smoke also contribute to ineffective breaching.[25]

Poor battle tracking hinders effective decision making. Units are slow to report and provide inaccurate information. TOCs routinely accept inaccurate information without attempting to quality control or correct incoming information. Units do not rapidly report information that relates to the commander's CCIR. Because information is mismanaged and moves slowly commanders are unable to develop the agility needed to get inside the enemy's decision cycle. [26]

Incomplete and inaccurate reporting prevent the commander from making timely and informed decisions. When SOPs have reporting and information distribution procedures they are usually not trained or used.[27]

Units do not effectively integrate attachments who do not habitually work with them in the decision making process. Air defense officers are often overlooked or ignored in the planning process. Units do not take advantage of their knowledge and expertise in the employment of air defense systems. Due to their rank and unfamiliarity with the unit

they are unable to integrate their knowledge into the process. The result is inadequate air defense coverage and improper employment of this specialized asset.[28]

The expertise of engineer planners from supporting engineer units is not consistently integrated into maneuver plans. Because this knowledge resource is not used in the TDMP, the terrain analysis portion of IPB lacks details and does not effectively support terrain visualization, the selection and development of engagement areas is poor, and units fail to execute proper breaching fundamentals in the offense.[29]

Unit deliberate obstacle breaches are executed slowly and not to standard. "It is apparent that these units train at Home Station against less than standard obstacles and with very little OPFOR resistance."[30]

Support battalions fail to adequately track information on delivery of supplies to forward units. Submission of "closeout" reports to track this information is often inconsistently executed. Reports are often inaccurate. Failure to track and maintain a record or database of this information leaves no audit trail to ensure missions were complete and provides no historical information to use for generating and improving the accuracy of future forecasts and requirements.[31]

BCTP

R & S plans are typically not focused and lack detail. The commander and staff do not develop effective Priority Intelligence Requirements (PIR) as part of the CCIR. PIR are not tied to specific NAIs or enemy actions, SIR are too general, and R&S assets are tasked beyond their capabilities to collect.[32]

Breaching operations are poorly planned and not rehearsed.[33] The supported tactical operation is generally unsuccessful.

TOCs are not managing information. Mismanagement of information results in poor situational awareness. Commanders do not have the facts they need to make critical decisions. Commanders seldom identify the critical information they need and the format they need it in. CCIR, when developed, are not posted in the TOC. Staffs do not use the event template and decision support template to help commander make decisions. TOCs do not adequately track the battle.[34]

Information is disseminated without analysis. S2s often simply post spot reports, and do not compare the information to situation and event templates to determine what course of action the enemy is employing, and what he might do next. S2s are more reactive than predictive. S2s often disseminate INTSUM/INTREP received from higher headquarters to subordinate units without tailoring them or filtering information for the unit mission. Subordinate units are overloaded with meaningless information. Units often place too much emphasis on the higher headquarters information and analysis than their own.[35]

Battle tracking is inadequate. Brigades rarely post location higher headquarters and adjacent units. Tracking of subordinate units is incomplete as is enemy situation. [36]

R&S plans are poorly executed. Status of assets is not monitored. When assets suffer casualties, they are not relieved or replaced. Assets report when they want to, not

on an organized schedule or based on time of key events. As a result, information on the enemy is not available to decision makers.[37]

Unit plans do not have sufficient flexibility. Task forces are not positioned to provide mutual support. Task Forces often act independently of other brigade units in the defense. Units do not adequately plan for the employment of a reserve or consider a defeat mechanism. Brigades usually do not provide a plan to create an assailable flank by use of fires or dynamic obstacles and then mass combat power.[38]

Brigade commanders and staffs demonstrate incomplete knowledge of the decision making process. Units do not develop different and complete courses of action. Units frequently do not gather all necessary wargaming tools, do not establish critical events and decision points, and ineffectively record the results of wargaming. Staff NCOs are not fully utilized in the decision making process.[39]

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